The Living Waters Edukit

Teacher's Guide

Media Resources

The **Living Waters Edukit** is available on slide/tape from your local Field Services Specialist, or on videocassette from the Access Media Resource Centre.

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Where To Find What

What It's All About. . .

The Living Waters Edukit tells the story of life in the eutrophic lakes and ponds of Elk Island National Park, Alberta.

The Edukit is a co-production of Parks Canada and ACCESS Alberta. It is compatible with both the objectives of Parks Canada and the school curricula of the province of Alberta.
Parks Canada's objective is:

> to protect for all time representative natural areas of Canadian significance in a system of national parks, and to encourage public understanding, appreciation, and enjoyment of this natural heritage for future generations.

The Edukit was produced to tell the story of the living waters to Alberta students.

To discover the interest and needs of Alberta teachers, a questionnaire was distributed to schools in the province. The questionnaire and its responses are included in the Edukit for your reference. Many of the suggestions were incorporated into the design of the Edukit. The responses indicated an interest in both on-site and in-classroom components. Study aids have been prepared for classroom instruction and a field trip guide for on-site use. The Edukit has been designed with flexibility so that it may be adapted to the particular needs of each teacher.

Theme and Objectives

The primary theme of the Living Waters Edukit is the interrelatedness of the living and non-living components of a pond ecosystem. The major concepts described include the following:

(a) the formation of a knob-and-kettle landscape by glaciation
(b) the effect of non-living factors on living organisms
(c) the role of producers, consumers, and decomposers
(d) food chains and food webs
(e) the importance of wetlands and the role of National Parks in preserving such areas.

Learner Objectives

As a result of using the Edukit, learners will be able to:

(a) describe the role of glaciation in the formation of a knob-and-kettle landscape.
(b) explain the effect of sunlight, temperature, and oxygen on aquatic life.
(c) define and give examples of a producer, consumer, and decomposer.
(d) describe the role of each of the above within the pond.
(e) explain the difference between a food chain and a food web.
(f) briefly explain how a pond may become a meadow or forest as a result of succession.
(g) list uses that have been made of wetlands in the past and describe how people's attitudes towards these areas are changing.

Here's What You Get

Copies of the Living Waters Edukit can be obtained in one of two ways.

1. **On Loan**

   These are available from:
   (a) ACCESS Field Services Offices (see list on inside front cover)
   (b) Elk Island National Park
   (c) Edmonton Public Schools (Science Resource Centre)
   (d) Calgary Board of Education (Science Resource Centre).

2. **To Keep**

   These are available from:
   ACCESS Media Resource Centre
   Health Sciences Centre
   3350 Hospital Drive NW
   Calgary, Alberta
   T2N 4N1
   (403) 283-8241

   Forward a blank 60 minute video-cassette or a school purchase order to cover the cost of the tape.

Print Component

Kits On Loan

The Living Waters Edukit Teacher's Guide

The Living Waters Edukit Field Trip Guide

Program Transcripts

Elk Island National Park brochures
Elk Island National Park
Astotin Lake and Living Waters of EINP
Winter Guide to EINP Alberta
Bison (EINP)
The Living Waters, EINP
Discover Astotin Lake (Game Board).

Kits To Keep

The Living Waters Edukit Teacher's Guide

The Living Waters Edukit Field Trip Guide

Elk Island National Park brochures are available by writing to:
Superintendent,
Elk Island National Park,
R.R. 1,
Fort Saskatchewan
Alberta
T8L 2N7

or by calling: (403) 998-3781

Alberta Environment – Communications
Aquatic Animal Life Worksheets
The Closed Ecosystem
Mosquito Kit
Understanding Alberta Lakes.

Alberta Environment publications are available by writing to:
Environmental Education
Coordinator,
Alberta Environment,
Communications Branch,
9820 - 106th Street,
Edmonton, Alberta
T5K 2J6

or by calling: (403) 427-6267

Alberta Energy and Natural Resources
(Fish and Wildlife Division)
Common Invertebrates of Alberta
Puddle Ducks of Alberta
Diving Ducks of Alberta
Swans, Cranes and Geese of Alberta.

Alberta Energy and Natural Resources pamphlets are available by contacting your local Fish and Wildlife office or by contacting:
Fish and Wildlife Division,
8th Floor, South Tower,
Petroleum Plaza,
9915 - 108th Street,
Edmonton, Alberta
T5K 2C9

or by calling: (403) 427-6729

results of "Needs/Interests"
Questionnaire distributed to
Alberta teachers

posters

Audio-Visual Component

Kits On Loan

Slide/tape programs: the kit includes six carousels of slides with six audio cassettes.
Program 1: How to Make a Lake
Program 2: Spring
Program 3: Summer
Program 4: Autumn
Program 5: Winter
Program 6: Elk Island National Park

Video-cassette: the 6 slide/tape programs transferred to one, sixty-minute cassette.

Kits To Keep

One, sixty minute video-cassette containing the 6 slide-tape programs.

How To Use It

. . . suggestions for lesson formats, including questions and activities for each program

Each program in the Living Waters Edukit is designed as a separate lesson and is about 10 minutes in length. A format for each program could include:

1. . . a sneak preview
   The transcript of each program is included in the Edukit to enable you to review program content before presentation. Key words identifying major program concepts are indicated by boldface type in the transcripts.

2. . . lights, camera, action
   You could now present the program to your class.

3. . . questions, anyone?
   A variety of questions and activities have been provided. You may choose to do them all, or, you may choose only those most appropriate to your students. The questions are based on the program as well as follow-up discussion and research. The activities are based on major concepts in each program and are designed to enhance science-process skills.

4. . . and now for a short quiz
   A review test, based on all six programs is included at the back of this **Guide.** Definitions for those words included in the glossary for each program are also at the back of the **Guide.**

5. . . where do we go from here?
   A list of suggested resources (including both print and audio-visual material) is at the back of the **Guide.**

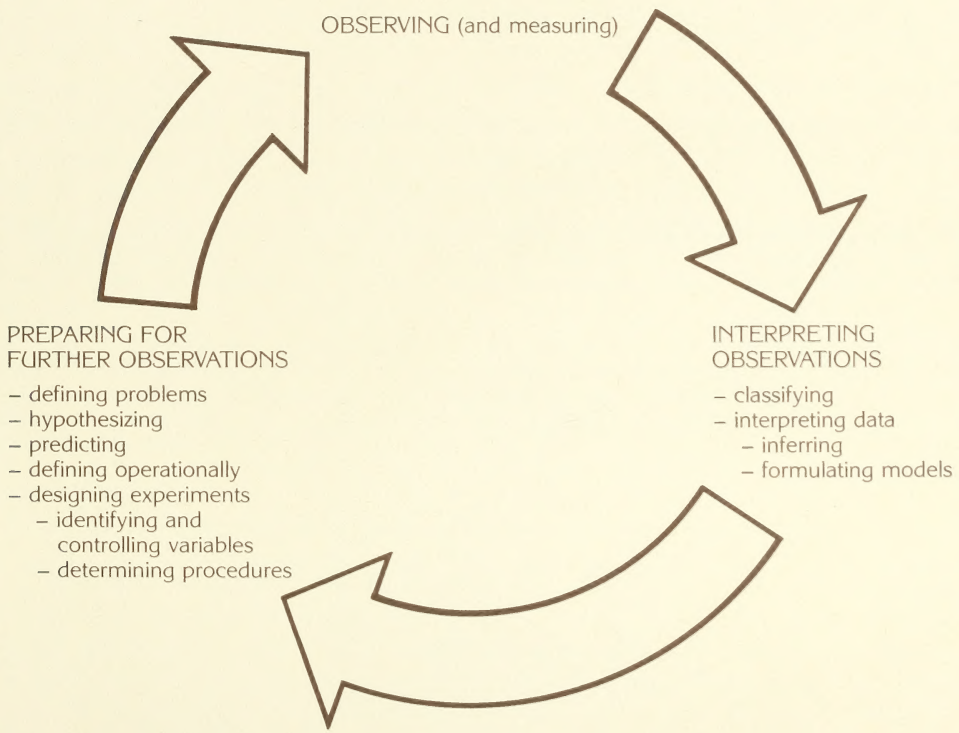
Inquiry Process Skills

Questions and activities included in this **Guide** provide numerous opportunities to develop student inquiry skills, especially those skills that involve science processes. These include:

1. observing
2. measuring
3. classifying
4. interpreting data
   - inferring
   - formulating models
5. defining problems
6. hypothesizing
7. defining operationally
8. predicting
9. designing experiments
   - identifying and controlling variables
   - determining procedures.

In some cases, the activities make direct reference to these skills. In others, the development of the skills comes not from the question or activity in itself but rather from the particular way it is introduced. For example, a question such as "What stages are there in the life cycle of a mosquito?" may be introduced simply as a recall question based on what students have read or heard, or as a question for direct observation and interpretation. Many observations can be made directly from the slide-tape material, some from illustrations in science textbooks and others from material in the "Flora and Fauna of Alberta" kit. Wherever possible, observations should be based on hands-on experiences, either in the classroom or on field trips. These experiences give opportunities for thoughtful interpretation of what students observe for themselves, and in turn can be the basis of new areas of questioning and inquiry.

A general model for this inquiry process is as follows:



The emphasis in this approach is not so much on introducing each particular inquiry skill, but rather involving students in the inquiry process as a general way of learning. In this process, the teacher serves to focus questioning and guide students in finding answers to questions based on resources that are available. Wherever possible, questions for inquiry should arise from the ongoing study and not be introduced as a list of questions by the teacher. The related questions given in this **Guide** are thus intended as suggestions, which the teacher may wish to incorporate into a larger inquiry process.

Bernie Galbraith

How To Make A Lake – Questions

How To Make A Lake – Activities

PROGRAM 1

How To Make A Lake Questions

1. Where is Elk Island National Park located?
2. Approximately how old are the Park's lakes and ponds?
3. What is a glacier?
4. When glaciers melt, they leave behind material called till. What is till and how does it become part of a glacier?
5. Describe the appearance of a knob-and-kettle landscape.
6. The ponds and lakes of Elk Island are described as "eutrophic." What does this mean?
7. When a plant or animal dies, its body decomposes. What does this mean?
   Give an example of a decomposer.
8. Explain the phrase "cold-blooded animal." Give an example.
9. Eutrophic lakes and mountain lakes are quite different in depth, temperature, and the amount of nutrients they contain. Fill in the chart with the correct answers.

	EUTROPHIC LAKE	MOUNTAIN LAKE
depth (shallow or deep)		
temperature (cold or warm)		
nutrients (large amounts or very little)		

10. What do you think happened to the plants and animals that were in the path of the ice as it moved south through Alberta?
11. What does the word "succession" mean?
    Describe some of the changes that might take place in the lakes and ponds of Elk Island over the next thousand years.
12. No streams or rivers flow into the lakes and ponds of Elk Island.
    The kettles fill up with water from rain and melting snow. What might happen to the amount of water in the kettles if very little snow fell one winter, and the following summer was hot and dry? What effect would this have on the plants and animals in the ponds?

How To Make A Lake
Answers To Questions

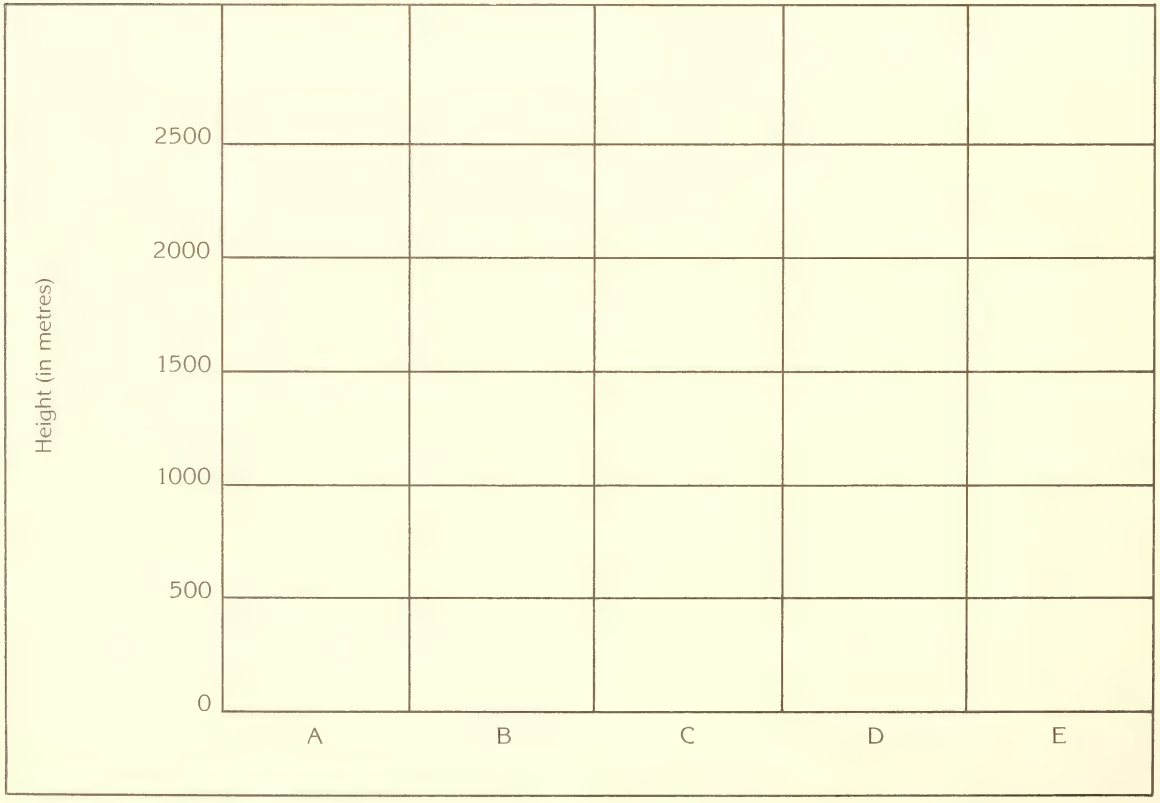
1. In central Alberta.
2. Less than 10,000 years.
3. A moving mass of ice.
4. It is a mixture of stones, gravel, and finely ground rock scraped up from the ground as a glacier moves along.
5. A number of low, rounded hills called knobs with depressions or hollows (often water-filled) called kettles.
6. The word "eutrophic" means "good food" or "nutrient rich."
7. The bodies break down, decay or rot. Snails and bacteria.
8. "Cold-blooded" refers to an animal whose body temperature changes as the temperature of its surroundings changes. Examples include all invertebrates, fish, amphibians and reptiles.
9. Eutrophic lakes are shallow, warm, and contain large amounts of nutrients. Mountain lakes are deep, cold, and poor in nutrients.
10. Some animals would move south to avoid the ice. Others may not have adapted to a changing environment and may have died. Plants are not able to move so they would have been overrun by the ice.
11. Succession is a series of slow changes in the types of plants and animals that are found in a particular area. Ponds and lakes will gradually fill in, turning to marshes and swamps. As more plants become established, meadows will appear and open waters disappear. Trees may finally grow over the spot where there was once a pond.
12. The very shallow ponds might dry up completely. Larger ponds and lakes may record a noticeable drop in water level. Animals and plants in ponds that dry up completely will die if all water disappears. (The seeds and spores of some plants may lie dormant until the following year and sprout when water becomes available.) Lakes whose water level drops may have lower populations of plants and animals since there is less room.

How To Make A Lake Activities

1. Label the following on the map of Alberta:
   (a) Rocky Mountains
   (b) Elk Island National Park
   (c) Edmonton
   (d) Calgary
   (e) Using arrows, mark the direction taken by the ice as it moved over Alberta.

2. The layer of ice that lay over Elk Island was about 1½ kilometres thick. To help you understand how deep that was, plot the following information on the graph provided.

(a)	Continental ice sheet	1500 metres
(b)	Manulife Place, Edmonton	146 metres
(c)	Calgary Tower	190 metres
(d)	Sulphur Mountain, Banff	2444 metres
(e)	Tallest tree ever measured	112 metres

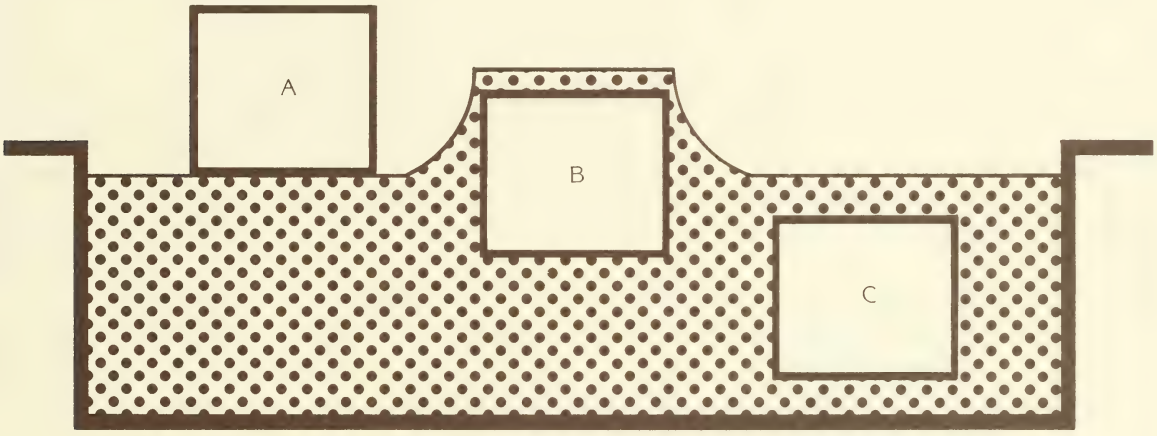


3. Kettles can be created by various processes. One idea or theory states that till on top of a glacier prevented the sun from melting the covered ice as fast as the uncovered ice. You can test this theory by the following experiment:

   Fill a cake pan or pneumatic trough with dry sand.
   Position 3 ice cubes as shown in the diagram:

   A – sitting on top of the sand
   B – covered with a thin layer of sand
   C – buried in the sand but not touching the bottom of the pan.

   Place the pan in sunlight or shine a strong light on it. Observe the pan and its contents for about thirty minutes, or until the ice cubes have melted.
   Record your observations every 5 minutes in the chart provided.



TIME (in minutes)	A	B	C
5			
10			
15			
20			
25			
30			

(a) Which ice cube melted first?
How long did it take?

(b) Which ice cube melted last?
How long did it take?

(c) What effect does covering the ice have on the time it takes to melt?

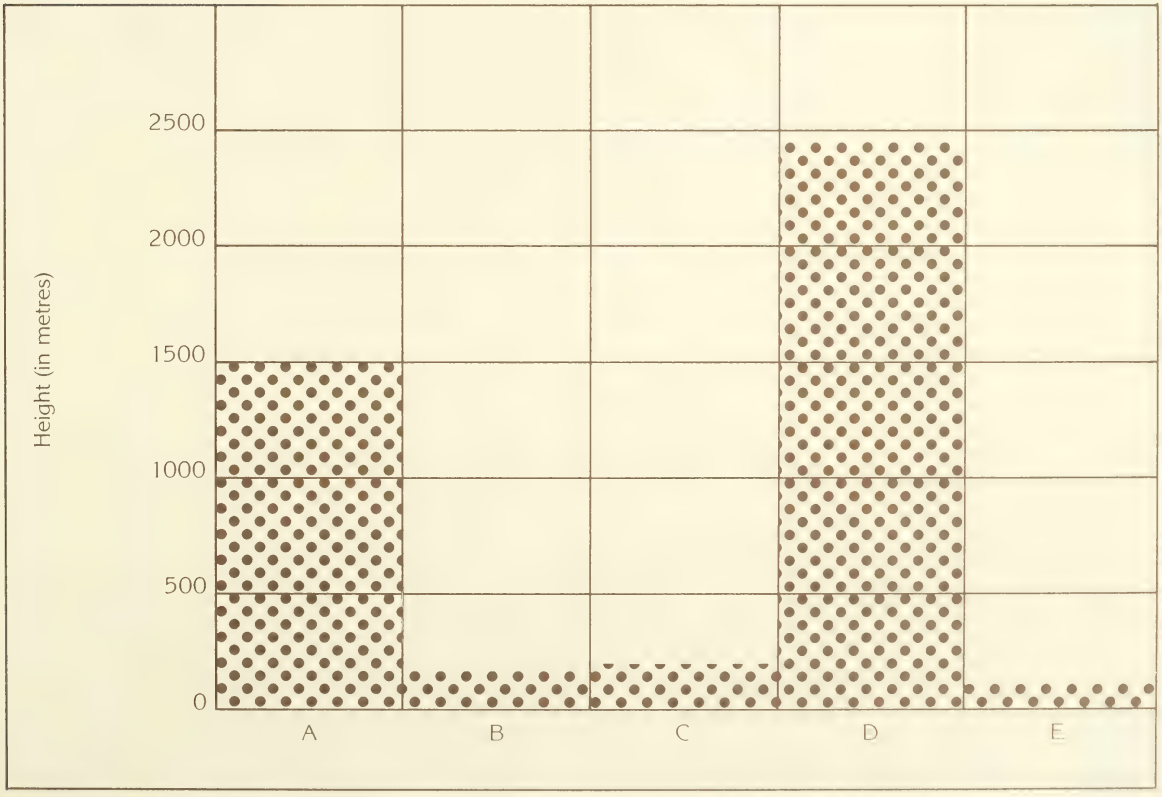
(d) After all the ice has melted, examine the three spots. Do all three places look the same or are they different? Explain.

How To Make A Lake
Answers To Activities

1

3 (a) The uncovered ice cube, A, melted first. (The time to melt depends on individual experiments.)
(b) The buried ice cube, C, takes the longest to melt.
(c) Covering the ice increases the time needed for it to melt.
(d) All three areas will be wet as a result of the melting. Position C should show a depressed area, as sand falls into the hole left by the melted ice cube. Position B may show a slight depression or a slight uneven surface. Again, results depend somewhat on individual experiments.

2



How To Make A Lake Glossary

advance
aquatic life
bacteria
cold-blooded
continental ice sheet
decay
decomposer
decomposition
depression
Elk Island National Park
environment
eutrophic
glacial till
glacier
ice age
kettle
knob
marsh
meadow
mineral
nutrients
organism
retreat
runoff
succession
toe

Spring – Questions

Spring – Activities

PROGRAM 2

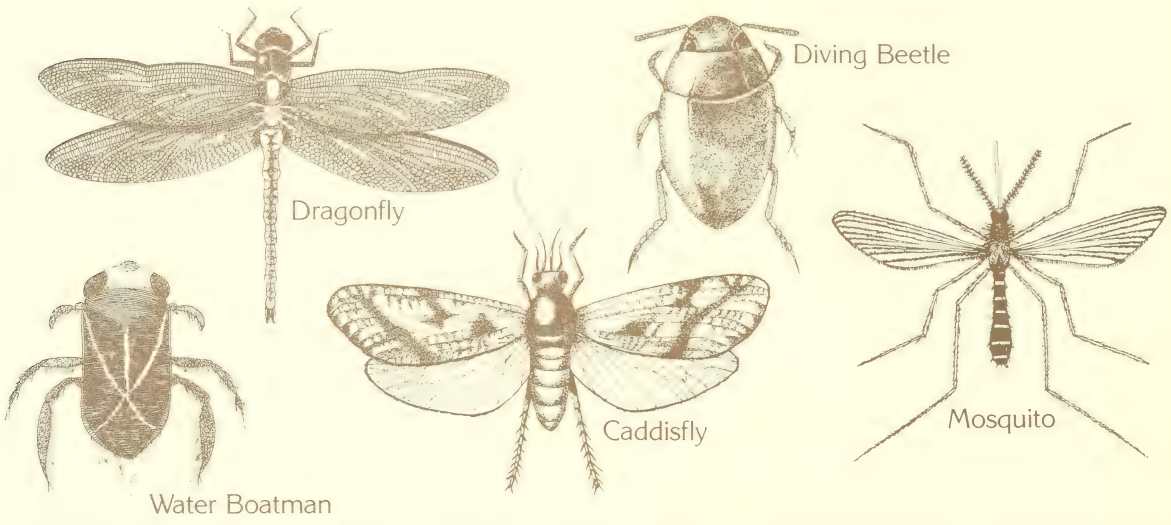
Spring – Questions

1. By the end of the winter, there is very little oxygen left in the pond water. Why? Describe how the supply of oxygen is increased once the ice melts.

2. What does the term "spring runoff" mean? Why is spring runoff important to life in the pond?

3. Some animals are described as "cold-blooded." What does this mean? Why do cold-blooded animals become more active in spring than in winter?

4. Many insects change as they grow from egg to adult. We call this series of changes "metamorphosis" meaning "change of form or structure." A caterpillar, for example, will change into a butterfly, and a legless, white maggot will turn into a house fly.
How good a detective are you? Can you match up each young pond animal with its correct adult form?



5. At one time, the dragonfly was called "the devil's darning needle" and people believed that it would sew together their lips or eyelids. Today, more is known about the dragonfly.
   (a) Do dragonflies attack humans?
   (b) What do dragonflies eat?
   (c) How do they catch their food?
   (d) Can a dragonfly use its legs for walking?
   (e) Dragonflies are often called "mosquito hawks." How do you suppose they got this name?

6. The muskrat and the beaver are both aquatic animals. This means that they spend most of their time in water. Both animals have adapted to a water environment but in different ways. Can you correctly fill in the missing information in this chart?

	BEAVER	MUSKRAT
A TAIL I Describe the shape and covering of the tail.		
II What is the tail used for?		
B FEET I What are the front feet used for?		
II What are the hind feet used for?		
III Which feet are webbed?		
IV Draw a foot showing the webbing.		
C FOOD I What kinds of food does this animal eat?		
II Does this animal store food for winter?		

7. In Elk Island National Park, the beaver and the muskrat are protected. This means that people can't bother or kill them.
   (a) Outside the Park, beaver and muskrat are often trapped and killed for their fur. Trappers don't usually kill these animals in the spring. Why not?
   (b) What season of the year produces the best pelt? Why?
   (c) Do you think animals should be killed for their fur? Explain your answer.

8. Farmers and ranchers sometimes want to get rid of beaver on their lands. Beaver cut down trees, build dams and flood land, and block drainage ditches and culverts (pipes.)
   Imagine that you are responsible for the wildlife in this province. How would you deal with a farmer or rancher who wanted to get rid of the beaver on his land?
   Here are three possible solutions. Which one would you recommend? Why?

(a) Trap and kill beaver.
(b) Trap beaver alive (without hurting them) and move them to another area.
(c) Pay the farmer money for the damage to his land and allow beaver to remain where they are.

9. The lakes and ponds of Elk Island and the surrounding area are called the "duck factory" of the prairies. To produce so many ducks, this area must provide everything that ducks need to survive. List three things that this area provides for ducks.

10. Mallards and red-necked grebes are birds common to Elk Island. Using the information contained in this table, answer the following questions.

	MALLARD	RED-NECKED GREBE
A Location of nest	• usually on ground, among plants, often far from water	• floating mass of plants anchored to reeds
B Average number of eggs laid	• 10 to 12	• 4 to 5
C Incubation	• done by female only • takes 26 to 29 days for eggs to hatch	• done by both male and female • takes 22 to 25 days for eggs to hatch
D Condition of young at birth	• covered with down • eyes open • able to follow parent	• covered with down • eyes open • able to follow parent
E Care by parent	• cared for mostly by female • young feed themselves	• cared for by both parents • parents feed the young
F Time it takes before young bird is able to survive on its own	• 7 to 8 weeks	• 8 to 10 weeks

(a) Which nest would a coyote be more likely to attack? Why?
(b) If the female died, what would probably happen to the eggs of the mallard? the red-necked grebe?
(c) Which eggs take longer to hatch?
(d) Which young bird, a duckling or a grebe, develops faster and is on its own sooner?
(e) If you were given an orphaned duckling and a grebe, both the same age, which would probably be easier to care for? Explain your answer.
(f) On average, a mallard tends to lay twice as many eggs as a grebe. Why do you suppose mallards lay so many eggs?
(g) In some areas, young grebes are eaten by fish. Would this be a problem in Elk Island? Explain.
(h) What dangers might mallard ducklings face as they journey from the nest to water?
(i) Mallards and grebes both spend a lot of time in the water, yet one nests on land and the other on water. Can you think of a reason why each bird nests where it does? (Hint: the legs of a duck are located in the centre of its body. The grebe's legs are farther back, toward the tail.)

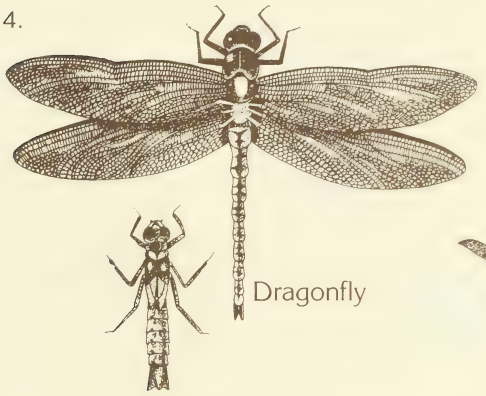
Spring
Answers To Questions

1. The animals in the pond use it up. Winds stir up the water and mix air (oxygen) back into the water. As green plants begin to grow, they also put oxygen back into the water.

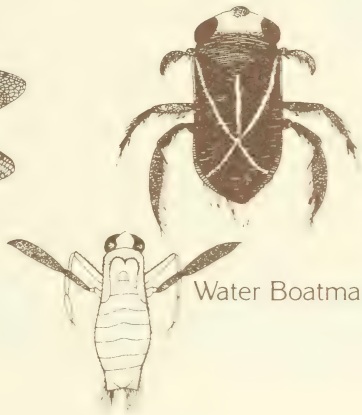
2. It refers to melting snow and rain that run off the knobs and into the kettles during the spring. It fills the kettles and also carries nutrients into the water from the surrounding land.

3. Cold-blooded means that an animal's body temperature changes as the temperature of its surroundings changes. The temperature of the pond water rises, and therefore the cold-blooded animals become warmer and are able to carry out all their activities.

4.

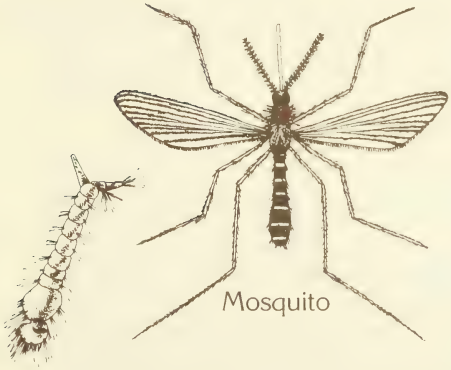


Dragonfly

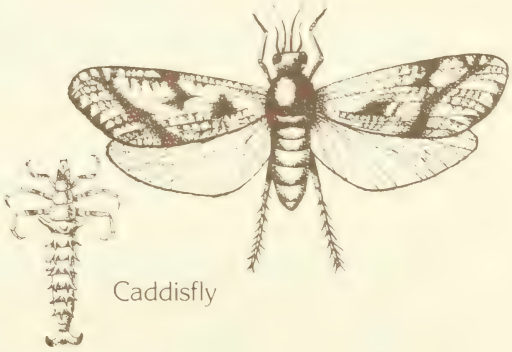


Water Boatman

Diving Beetle

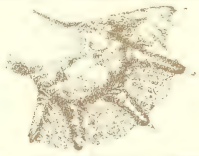
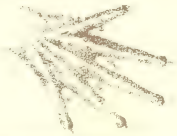


Mosquito



Caddisfly

5. (a) No, they don't.
   (b) They eat insects such as mosquitoes.
   (c) They catch these insects while they are flying. They form a basket with their legs and scoop insects out of the air.
   (d) No, the legs are useless for walking.
   (e) Hawks are skilled hunters in the air, and so are dragonflies. The label "mosquito" refers to one of the main items in the dragonfly's diet.

6.	BEAVER	MUSKRAT
A I	• flat, paddle-shaped, covered with scales and a few hairs	I • long, rat-like, scaly, some hairs
II	• used as a rudder when swimming • not used as a shovel	II • used as a rudder
B I	• front feet used for grasping • not used for swimming	I • front feet used for grasping • not used for swimming
II	• hind feet used for swimming	• hind feet used for swimming
III	• only hind feet are webbed • full webbing between toes	• only hind feet are webbed • full webbing between toes
IV		
C I	• feeds on bark of several trees and shrubs. Does not eat any animal matter.	• feeds on pond plants such as cattails and bulrushes, plus some animal food (turtles, frogs and fish.)
II	• stores food for winter	• does not store food for winter

7. (a) Spring is the time when young are born. If the breeding population is wiped out, no more animals will be produced. Also, the fur in spring is of poor quality, as the winter hair is being shed.
   (b) Fall and early winter produce the best pelts because the animal grows a rich, thick coat for the cold weather.
   (c) Individual student answers.

8. Individual student answers.

9. This area provides plenty of food, suitable nesting sites, and protection from predators (including man.)

10. (a) Coyotes are land predators, so they would more likely find and attact a mallard nest.
    (b) The mallard eggs would probably fail to hatch, since the female incubates the eggs. The red-necked grebe could incubate the eggs if its mate died.
    (c) Mallard eggs (26 to 29 days)
    (d) Mallard (7 to 8 weeks)
    (e) The mallard would probably be easier to care for because it is able to feed itself (unlike the grebe who depends on its parents.) It also develops faster than the grebe.
    (f) Perhaps more young mallards die, as only the female incubates the eggs and cares for the young. Both parents raise, and care for young red-necked grebes.
    (g) No, because only very small fish (fathead minnows and sticklebacks) are found in the waters of Elk Island.
    (h) Ducklings may be separated from the flock and become lost. Predators may kill them.
    (i) Mallards are able to walk easily on land and have no difficulty travelling from the nest to water. Grebes have considerable difficulty walking on land; their legs are weak and positioned too far back to enable them to walk properly. Nesting on water means they have only to scuffle away from the nest and drop into the water.

Spring – Activities

1. Have students examine algae from an aquarium or a pond. Use hand lenses and microscopes. Using books such as the Golden Guide **Pond Life**, have students try to identify some of the algae they see. Make drawings of the algae. Can students find examples that are string-like, rounded, have tails, or are box-like? (These types are all mentioned in the slide program.)

2. Place some pond water in an aquarium or in smaller containers such as a dish or plastic cup. Add a small number of duckweed plants collected from a pond. Place the container in a sunny area for two months or more, adding pond water as needed.
   (a) Record the number of duckweed plants.
   (b) How long does it take for the number of plants to double? quadruple?
   (c) How long would it take for the duckweed to cover the surface of the container?

3. Although we may think new plants grow only from seeds, plants can be produced in other ways. Have students grow new plants using one or more of the following techniques.
   (a) Runners (stolons): strawberry plant, spider plant
   Where a strawberry runner touches the ground, it takes root and produces a new plant. In time, the runner dies and the two plants separate.
   Spider plants are produced at the end of a runner suspended in the air. Cut one or two spider plants free from their runners and plant them in soil. Plant one or two other spider plants in soil but leave the runners in place. Which group of young plants grows better? Why?
   (b) Budding: Mexican hat plant, duckweed
   In the process of budding, tiny new plants appear on the body of the parent plant. New Mexican hat plants appear on the edge of the leaves, much like a fringe on a sombrero.
   Duckweed, one of the smallest known flowering plants, rarely produces flowers. Most of its reproduction is by a division of the plant body.
   (c) Cuttings: geranium, poplar
   Take a sharp knife and cut off the end of a geranium stem.
   (Don't use a piece more than about 8 to 10 centimetres in length.)
   Make the cut just below a node (the joint where a leaf has grown.) Place the slip or cutting in moist vermiculite or clean sand. Within a couple of weeks, roots should appear.
   Transplant to soil.

   Try a cutting from a poplar tree in late winter or early spring, before the buds have opened. Place the cutting in water. (Your cutting can be three or four times the length of the geranium cutting.) The leaf buds should open up, and within a few weeks roots should appear. Transfer the cutting to damp sand for a week or two, then transplant into soil.
   (d) Leaves: jade plant, violet
   Leaves of the jade plant that fall onto soil will produce roots and start new plants. Violet leaves placed in water or loose soil will also produce roots and form a new plant.
   (e) Underground stem (rhizomes and rootstocks): onion, tulip
   Many perennial pond plants, including cattails, pondweeds, arrowhead and pond lilies, can be grown from underground stems. Compare the length of time it takes to grow an onion from seed with growing one from an onion set.
   Find a potato with "eyes." Cut off one or two pieces, each with an "eye." Plant these in soil. Also plant a piece of potato without any "eyes." What happens to these?

4. Invertebrates are easy to keep and form good subjects for the study of metamorphosis.
   Check trees, shrubs, and small plants in the schoolyard or community for caterpillars. Collect five or six caterpillars, plus some of the plant material where they were found.
   Set up a "caterpillar farm" in an aquarium tank or large glass jar. Put a layer of soil on the bottom. Add twigs or small branches for the caterpillars to crawl on. Add a supply of the leaves on which the caterpillars were

found (some caterpillars will feed only on one particular plant.) Keep the caterpillars supplied with water – sprinkle drops of water onto the plants and soil, or, mist the container with a hand-pump aerosol. Cover the container with screen or cheesecloth to stop the caterpillars from escaping. (It will also prevent the adult insects from escaping before you have a chance to study them.) Stems or plant branches can be placed in a jar of water in the container. (The mouth of the jar should be covered with tinfoil or cotton to prevent the caterpillars from falling in and drowning.)

(a) Many insects go through four stages in their life cycle: egg, larva, pupa, adult. Which of these four stages does a caterpillar represent?

(b) What will a caterpillar turn into?

(c) What stage does a cocoon represent?

(d) What happens inside the pupa?

Make daily observations of the caterpillars and the changes they undergo. Maintain the farm long enough to observe the changes from caterpillar to pupa (some insects pupate in the ground and some on twigs or under bark) to adult.

(e) How many legs does a caterpillar have?

(f) How many legs does an adult insect have?

(g) Caterpillars are able to spin silk. What is the silk used for? Where are the silk glands located? Spiders also spin silk. Where are their silk glands located?

The word "metamorphosis" means a change of form or structure. Insects that go through four stages (egg, larva, pupa, adult) are said to undergo complete metamorphosis. This doesn't happen to all insects. Some insects do not have a pupal stage, and the young often look much like the adult. This is called simple or incomplete metamorphosis. The young of these insects are called nymphs (or naiads if they live in water.) You might want students to set up an aquarium to study aquatic insect development. This requires a bit more effort than a caterpillar farm. It may also take some time to determine what type of food (plant, animal or a combination) the naiads require.

Study the following list of insects. Put the letters CM after those that go through complete metamorphosis. Put SM after those that go through simple metamorphosis.

Butterfly _____
Dragonfly _____
Grasshopper _____
Bee _____
Moth _____
House fly _____
Water strider _____
Water boatman _____

5. Frogs and toads also exhibit metamorphosis.
Set up a "frog farm" in an aquarium tank. Use pond water and add about a dozen frog eggs or tadpoles, along with a supply of algae from the pond. Use no less than one litre of water per tadpole. When the water level goes down, add pond water. If pond water is unavailable, use dechlorinated water. A small piece of lettuce that has been softened by boiling may be used as a substitute food. Make up packages of lettuce and freeze them for later feedings. Put some lettuce in the water in the morning and remove it several hours later. Learn to gauge how much they will eat. Do not leave old food in the water. Have students make observations every two or three days. Combine written descriptions with drawings. Record information about the following:

(a) Hatching date
(b) External (outside) gills visible
(c) External gills disappear
(d) Tadpole attaches itself to pond plants
(e) Front legs appear

(f) Hind legs appear
(g) Tadpoles start gulping air at the surface of the water
(h) Young frog comes out on land.

About the time the hind legs appear, tadpoles begin a change in diet. Supply them with tiny aquatic animals or try very small bits of meat. (Tadpoles that lack food may begin to eat each other.) Arrange the aquarium so that there is a flat rock from the water into the air. Once the tadpoles begin gulping air and the front legs appear, they will need something to crawl onto to get out of the water. When the tadpoles reach the frog stage, return them to the pond where you got the eggs or young frogs. You may want to keep one or two adult frogs, but they are carnivorous and need a ready supply of insects, spiders, and worms to stay healthy.

(i) What do young tadpoles eat?

(j) What do adult frogs eat?

(k) What happens to a tadpole's tail as it changes into a frog?

(l) The word "amphibious" comes from two Greek words meaning "double life." Frogs belong to a group of animals called amphibians. Why do you think frogs were given this name?

Spring – Answers To Activities

1,2 Answers to questions depend on individual students.

3. (a) The spider plants attached to the parent plant will grow better.
The parent plant will continue to supply water and nutrients until the young plant's root system is established and it can carry out these functions on its own.
(e) The potato parts with "eyes" will produce new plants. Those without "eyes" will not grow at all.

4. (a) The larval stage
(b) A cocoon or pupa
(c) The cocoon is the pupal stage.
(d) The whole body of the insect is reorganized to form the adult.
(e) The number will depend on the species, but most will have 8 pairs of legs.
(f) Three pairs
(g) The silk is used to make a cocoon or pupal case. The silk glands of the caterpillar are located on the head. Spider silk glands are located on the end of the abdomen.

Butterfly – CM, Dragonfly – SM, Grasshopper – SM, Bee – CM, Moth – CM, Water strider – SM, Water boatman – SM, Housefly – CM

5. (a to h) Answers to questions depend on individual situations.
(i) Tadpoles feed on algae when they are young, gradually changing to more animal matter as they grow older.
(j) Adult frogs are carnivorous, eating insects, spiders, worms, small fish and tadpoles.
(k) The tail slowly shrinks and disappears entirely. The material (food) in the tail is absorbed by the frog's body.
(l) As tadpoles, they live in the water, and later, as adults, they spend much time on land.

Spring – Glossary

algae
amoeba
annual
backswimmer
bladderwort
bufflehead
caddis fly
cold-blooded
coot
crane fly
daphnia
duck factory
energy
fairy shrimp
filament
habitat
hibernate
hydra
mayfly
migrate
moult
naiad
oxygen
paramecium
perennial
predator
push-up
red-necked grebe
red-winged blackbird
rotifer
runoff
sandhill crane
spore
spring overturn
stickleback
water flea
water strider
whirligig beetle

Summer – Questions

Summer – Activities

PROGRAM 3

Summer – Questions

(1) What is an ecosystem?

(2) List the three elements that make up the living part of an ecosystem. Provide three examples of the non-living aspect.

ECOSYSTEM	
LIVING	NON-LIVING
1	1
2	2
3	3

(3) What are nutrients?

(4) Where do plants get their nutrients? animals?

(5) Fill in the following chart.

	DEFINITION	EXAMPLE
Producer		
Consumer		
Decomposer		

(6) What four things do plants need to make food?
What gas do plants produce during food-making?

(7) What is a herbivore? a carnivore? Give an example of each.

(8) What is one of the most important plants in a pond? Why?

(9) What is an algal bloom?
What happens during a population crash?

(10) What is summer-kill?
What causes it?

(11) List two ways in which oxygen can enter pond water.

(12) What is a food web?

(13) Study this diagram of a pond ecosystem. Using the plants and animals mentioned here, give one example for each of the following words:

(a) producer
(b) herbivore
(c) carnivore
(d) decomposer
(e) source of all energy
(f) first-order consumer
(g) second-order consumer
(h) third-order consumer
(i) fourth-order consumer
(j) zooplankton

Using coloured pencils, trace three different food chains. List the food chains below.

(a)
(b)
(c)

(14) Write a food chain for each of the following environments.

(a) a desert area
(b) a forest
(c) the arctic tundra
(d) the ocean

(15) What will happen to the algae in the pond in autumn? Will algae be able to survive in the pond during winter? Explain.

(16) Plants and animals need nutrients for proper growth. Do you need nutrients? If so, from where do you get your nutrients?

(17) Not all plants are able to make their own food. Fungi, for example, are unable to make food the way algae or cattails do.

(a) What special substance do fungi, such as mushrooms, lack?
(b) Where do fungi get the food (nutrients) they need?

(18) Summer-kill occurs in the pond when there is a lack of oxygen. A severe lack of oxygen also occurs during one other season. What season do you suppose that is? Why would there be a lack of oxygen at that time?

(19) When the temperature drops, cold-blooded animals become sluggish and inactive. What happens to these animals during summer? (Can it ever become too hot for cold-blooded animals?)

(20) A number of people who keep gardens also have compost piles to which they add grass clippings, egg shells, orange peelings, potato peelings, and the like.

(a) What happens to all the material in a compost pile?
(b) Why do gardeners put compost on their gardens?
(c) Is there any activity in the compost pile during winter?

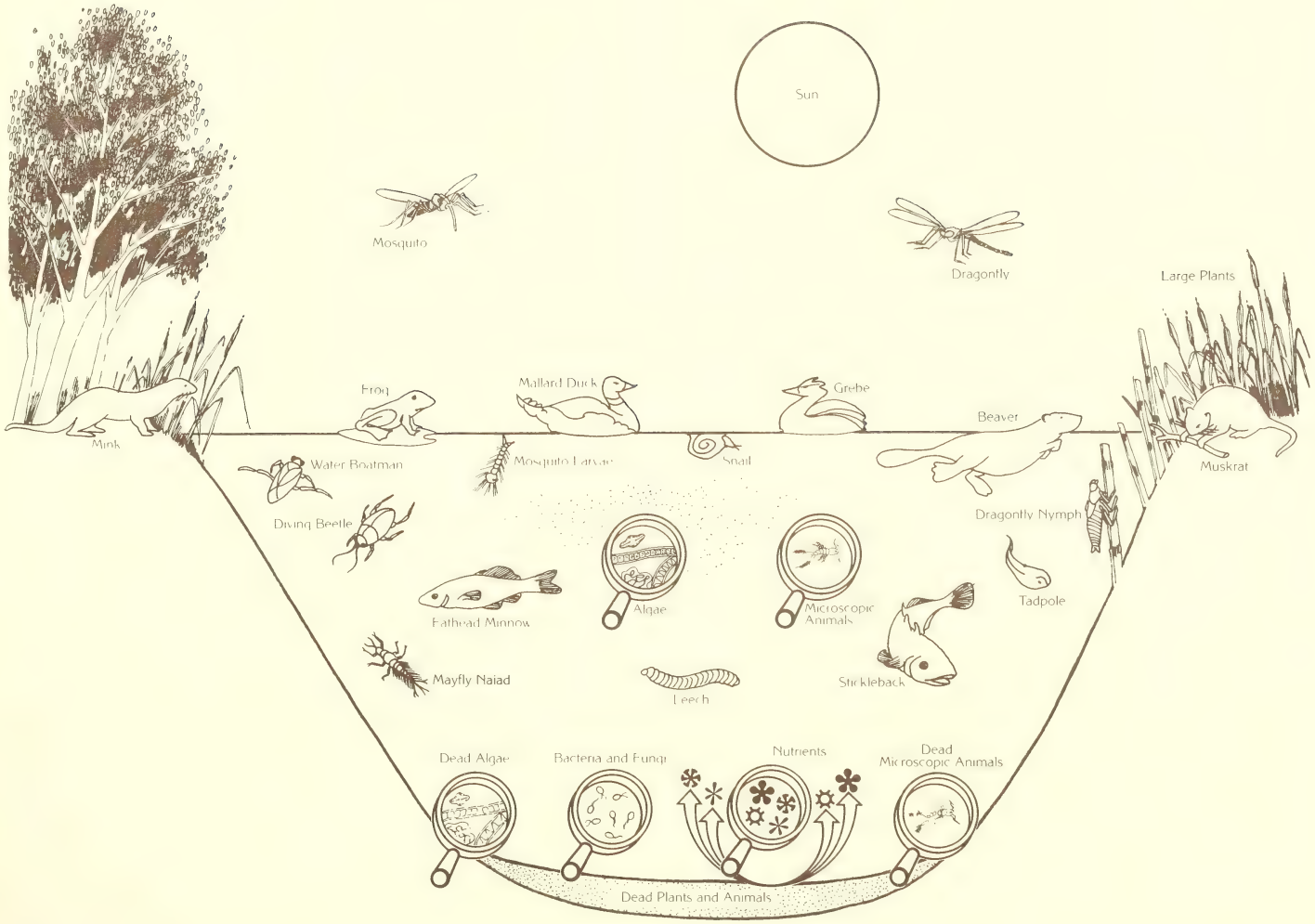
(21) Photosynthesis (the process by which green plants "manufacture" carbohydrates, sugar and starch) has been called the most important process in nature. Suggest some reasons why this might be so.

(22) What is always the first or beginning link in most food chains or webs?
Explain why.

(23) Predict what might happen if all the algae disappeared from the pond.

(24) What would happen if all the decomposers in the pond disappeared?

A Pond Ecosystem



(25) Swimmer's itch bothers many people who swim in Alberta's lakes.

(a) What causes swimmer's itch?
(b) Is it a serious problem for swimmers?
(c) What is a parasite?
(d) What is a host?
(e) What are the normal hosts for the parasite that causes swimmer's itch?
(f) Using your knowledge of food chains and webs, what sort of action, if any, would you recommend for dealing with the problem of swimmer's itch?

(26) Plankton are small, often microscopic organisms that float or swim in water. These tiny plants and animals are an important source of food for many animals. The largest animal that ever lived is the blue whale. (A newborn blue whale calf weighs more than a full-grown elephant.) Blue whales feed almost entirely on krill.

(a) What is krill?
(b) How do these whales catch and eat krill?
(c) Where are the largest supplies of krill in the world located?
(d) What other animals besides whales depend on krill?
(e) Many of the world's oceans have been over-fished. Some countries are now planning to harvest krill instead of fish. What effect will this have on those animals that depend on krill for food?

Summer
Answers To Questions

1. It is a group of plants and animals living together in a particular environment. The non-living and living parts of each ecosystem interact and influence each other.

2. Living: Decomposers, Producers, Consumers (any order)
   Non-Living: Temperature, Light, Air, Water, Soil (any three)

3. They are food substances such as nitrogen and phosporus that living things need for proper growth.

4. Underwater plants get their nutrients from the water.
   Animals get their nutrients by eating plants and/or other animals.

5. Producer: a plant that is able to make its own food (algae, cattails.)
   Consumer: an animal that gets its food by eating other living things (frog, fish.)
   Decomposer: an organism that breaks down or decomposes the bodies of dead plants and animals (bacteria, snail.)

6. sunlight, chlorophyll, air (carbon dioxide), water;
   oxygen

7. A herbivore is an animal that eats plants, e.g., tadpole, water boatman.
   A carnivore is an animal that eats other animals, e.g., dragonfly, coyote.

8. Algae; they provide food for many pond animals and they also produce oxygen. (Other answers are also acceptable.)

9. A sudden, rapid growth of algae, a population explosion.
   There is a sudden, rapid death among a certain group of organisms (such as algae.)

10. The death of organisms in a pond or lake during summer. It is caused by lack of oxygen.

11. It is produced by aquatic plants, such as algae, and is mixed in from the air as a result of summer breezes and wave action.

12. a number of food chains joined together

13. (Individual student answers based on the diagram.)

14. Here are some possible answers. (Others are also acceptable.)
    (a) desert plant – kangaroo rat – rattlesnake
    (b) tree – carpenter ant – woodpecker
    (c) arctic plants (lichens) – caribou – wolf
    (d) ocean plants (algae) – small fish – large fish – man.

15. As the amount of light decreases and the temperature drops, food production slows down.
    Ice and snow will block out light, and the algae will be unable to make food.

16. Yes; from the food you eat.

17. (a) chlorophyll

    (b) They get their food by living off the dead remains of other organisms or by living off live organisms (as parasites.)

18. The other season is winter. Winter-kill occurs because decomposers and animals in the pond use up all the oxygen. There are no green plants to replace the oxygen and, because the pond is covered with ice, no oxygen can get in from the air.

19. During summer, cold-blooded animals must be careful to avoid overheating. Temperatures that are too high can kill them. Some animals, such as turtles, estivate in the mud at the bottom of the pond.
Estivation is the summer equivalent of hibernation. It is a period of inactivity designed to avoid a harsh environment.

20 (a) It eventually breaks down or decomposes.
(b) Compost contains many nutrients needed by plants.
(c) No. In Alberta, temperatures are too low, and all decomposition stops until the return of warmer weather.

21. Green plants are the only organisms able to capture the sun's energy. Without this energy, life would not be possible. Animal life is dependent on plants for food.

22. The sun. It provides the energy needed by green plants in order to make nutrients. The energy trapped by green plants is then passed on to animals when they eat plants, or, when they eat other animals.

23. All the animals that fed on algae would disappear unless another source of food could be found. Every food chain that contained algae would be affected. Because all chains are interconnected, even those that did not contain algae would be affected because consumers would be looking for other sources of food.

24. The bodies of dead plants and animals would pile up instead of breaking down. Once all the nutrients were used up, no more life would be produced. The pond would be lifeless.

25. (a) A tiny animal called a fluke.
(b) No. The parasite can't infect people but it does cause an itching sensation as it tries to burrow into the skin.
(c) A parasite is an organism (a plant or an animal) that lives in or on another living organism and is detrimental to that organism.
(d) A host is the plant or animal that provides food (nourishment) for the parasite and without which the parasite would die.
(e) The normal hosts for the swimmer's itch parasite are snails, and, ducks and muskrats.
(f) In order to break the cycle, one would either have to remove all the ducks and muskrats, or, all the snails. Any food chains that contained these animals would thus be affected, as would the whole pond ecosystem. Simply showering or washing oneself after swimming is enough to get rid of the parasite and stop the itching.

26. (a) Krill are small, shrimp-like animals that feed on tiny plants in the water.
(b) The blue whale has large plates of baleen (whalebone) in its mouth that act like giant filters to scoop the krill out of the water.
(c) The largest populations of krill are located in the Antarctic, where they occur in such large numbers that they colour the sea red.
(d) Crab-eater seals and penguins (the Adelie and gentoo) rely almost totally on krill.
(e) If krill populations are over-harvested, as certain fish populations have been in the past, then those animals that depend on it may die if other sources of food are not available.

Summer – Activities

1. Set up a temporary pond in your classroom. Small wading pools or several plastic trays make good holding pools for your pond water. Collect pails of water from a pond or slough. (The amount will depend on the size of your holding containers.)
   Use Environment Fact Finder #9: Aquatic Animal Life Worksheets to help students identify the animals in their "pond."
   After a few days of study, return the pond water to its original location. You might want to do this activity at different times of the year, keeping a record of the types and numbers of organisms in your samples. You might also want to have students draw possible food chains or food webs based on the animals in their "pond."
   Useful references for this activity include the ESS unit titled "Pond Water" and the WEDGE unit titled "The Pond Book."

2. Set up a closed ecosystem. (See the enclosed direction sheet.)

   (a) What producers are found in your ecosystem? Consumers?
   (b) What is the energy source of your ecosystem?
   (c) Draw a food chain or food web to show the relationships among the organisms within your ecosystem.
   (d) Why is this called a closed ecosystem? Explain your answer.
   (e) Is a pond a closed ecosystem? An aquarium?
   (f) What would happen to your ecosystem if you placed it in the dark for a week?

   While the concept of a closed ecosystem seems sound, the system often fails. If this happens, discuss probable causes. Try the system again and see if you have solved the problem.

3. Check nearby pools or still water (or the Science Resource Centre) for mosquito larvae. Bring a number of larvae into class for observation and study. See the enclosed "Mosquito Kit" for suggested activities. Although this kit is designed for high school students, the activities mentioned below are easily adapted for elementary students.
   See the following in the Mosquito Kit:

   Mosquito Kit – Some Field Study Equipment
   Field Study Identifications
   A Lab Investigation
   – Working with Larvae: Observing Anatomy and Behaviour
   – Working with Larvae: Feeding and Rearing
   – Working with Larvae: Temperature Experiments.

4. An algal bloom can be studied on a small scale in the classroom.
   Add an eyedropper of pond water to a glass jar containing each of the following:

   (a) distilled water
   (b) tap water
   (c) tap water with a small amount of household or garden fertilizer added to it (follow directions on the package.)

   Label each jar correctly, as to type of water.
   Place the jars in the sunlight, or near a strong lamp. If you need to add water to replace that lost to evaporation, make sure to add the same type of water to each respective jar.
   Observe the jars and their contents over several months.

   (a) Which jar shows the best growth? the least growth?
   (b) Explain why there is a difference in the growth of the algae.
   (c) Will your algal bloom experience a population crash? Explain.

5. Obtain a Venus's fly-trap from a local garden shop. Observe this plant for several weeks.
   (a) What makes this plant different from most other house or garden plants?
   (b) Is this plant able to make its own food?
   (c) Can green plants ever be consumers?
   (d) How does the fly-trap attract flies and other insects?
   (e) What does the fly-trap do, once an insect lands on one of its special leaves? How long does the trap stay closed?
   (f) Will the fly-trap "eat" food other than insects? Try a tiny piece of raw liver or hamburger.
   (g) Will the fly-trap close on any object, such as a toothpick or your finger?
   (h) Are Venus's fly-traps found in North America?
   (i) The waters of Elk Island contain a small plant called a bladderwort. What unusual habit does this plant have?
   (j) Pitcher plants, sundews, and common butterworts (a relative of the bladderwort) are carnivorous. What does this mean? How do each of these plants trap insects? In what type of environment do you find these plants?

Summer
Answers To Activities

1,2,3 Individual student answers

4. (a) The jar containing tap water and fertilizer will produce the best growth. The least growth will occur in the distilled water.
   (b) The amount of growth depends on the supply of nutrients. Distilled water contains the least amount of nutrients, while the tap water containing fertilizer has the most.
   (c) Once the supply of nutrients is used up, no further growth will occur. When the algal bloom reaches a certain age, it may die, causing a crash.

5. (a) It catches live animals.
   (b) The fly-trap does contain chlorophyll for food-making but it also needs the nutrients found in the insects it traps.
   (c) Yes, when they trap live food.
   (d) It produces a smell that attracts them.
   (e) The leaf closes around the insect. (Time an actual feeding by a leaf.)
   (f) (Answer based on observation.)
   (g) (Answer based on observation.)
   (h) Yes, they occur along the southeastern coastal areas of North America.
   (i) Although the bladderwort contains chlorophyll and can make some of its own food, it also has small bladders with lids that open to suck up tiny water animals. These animals provide it with important nutrients.
   (j) "Carnivorous" means meat-eating. These plants are found mainly in acid, freshwater wetlands.

   Pitcher Plants
   The upper end of the leaf is shaped like a water jug or pitcher. Bright red colouring on the upper part of the leaf, plus a sugary smell attract insects. The inside walls of the pitcher are slippery, and many animals slide down. Backward-pointing hairs on the walls prevent animals from crawling out. The bottom of the pitcher is filled with a watery liquid containing digestive juices similar to those in our own stomachs. These dissolve the insect bodies, leaving only the hard, empty skeletons. (This plant is Newfoundland's provincial flower.)

   Sundews
   These plants grow in Alberta and are found in wet, boggy areas in black spruce forests. Slender hairs on the end of each leaf produce clear drops of sticky liquid, which trap the insects. Once an animal is caught, the hairs or tentacles fold over the insect and digest it.

   Butterwort
   This plant belongs to the same family as the pond bladderwort. It lives in wet marshy areas. The upper surface of each leaf is covered with tiny hairs that produce a sticky fluid. Once an insect or other small animal is caught, the edges of the leaf roll over and the prey is digested. This plant also occurs in Alberta.

   These three plants contain chlorophyll and so can make their own food. However, they live in environments where the supply of nitrogen (an important nutrient for plant growth) is lacking or in very short supply. Insect bodies provide these plants with the necessary nitrogen.

Summer – Glossary

algal bloom
carbon dioxide
carnivore
chlorophyll
consumer
ecosystem
first-order consumer
food chain
food web
fourth-order consumer
herbivore
nitrogen
phosphorus
population crash
population explosion
producer
second-order consumer
sideswimmer
summer-kill
third-order consumer
waterfowl

Autumn – Questions

Autumn – Activities

PROGRAM 4

Autumn – Questions

1. Why is there little oxygen left in the pond by autumn?
2. Describe what happens in a lake or pond during fall overturn. Explain why overturn occurs and why it eventually stops.
3. What role does wind play in putting oxygen back into the water?
4. What happens to the amount of sunlight entering the pond during autumn? Does this affect the green plants in the pond? How?
5. Is any more oxygen able to enter the pond once it freezes over?
6. (a) Algae are annuals. What does this mean? How do annuals like algae prepare for winter?
   (b) Cattails are perennials. What does this mean? How do perennials like cattails prepare for winter?
7. Animals prepare for winter in a number of ways. List three of these ways and give an example of an animal for each one.
8. Plants store food in different areas of their bodies. What plants do we eat that store extra food in their:
   (a) seeds?
   (b) roots or underground stems?
   (c) above-ground stems?
9. Carnivorous animals are animals that eat mainly meat. Herbivores are animals that eat mainly plants. People are examples of omnivores. What does the word "omnivore" mean?
10. All waterfowl (ducks and geese) leave Elk Island in the autumn and migrate to other areas. What dangers do these birds face when they leave the protection of the Park?
11. Suppose one winter the weather remained warm and no ice formed on the lakes and ponds. What might happen to the plants and animals in the water?
12. Cold-blooded animals that live in the pond are protected from winter's temperatures by the layer of ice and snow over the pond surface.
    What happens in winter to cold-blooded animals (such as snakes, beetles or spiders) that live on the land?
13. Muskrats do not build a large food cache like the beaver.
    (a) Where do muskrats find food in winter?
    (b) Where do they eat the food they find?

Autumn
Answers To Questions

1. Animals and decomposers have used up much of it.
2. Surface water is cooled and becomes more dense, forcing warmer water from the bottom to the surface. This then cools and sinks, continuing the cycle. The process stops when all the water is at the same temperature.
3. It acts like a giant blender, churning the surface and mixing oxygen from the air into the water.
4. It decreases.
   Yes. They are unable to make as much food or produce as much oxygen as during the summer months.
5. No. The layer of ice and snow prevents oxygen from entering the pond.
6. (a) Annuals live for less than a year or one season. Algae prepare for winter by producing spores, which will form new plants the following year.
   (b) Perennials live for more than one year. They prepare for winter by storing food. In the case of cattails, food is stored in underground stems.
7. Any three of the following answers:
   Migrate – ducks, geese
   Hibernate or become dormant – frog
   Die but produce eggs – daphnia
   Reduced level of activity – invertebrates, fish
   Normal level of activity – beaver (stores food)
   – muskrat (little or no food stored)
8. (a) peas, beans, corn
   (b) carrots, radishes, beets, potatoes
   (c) rhubarb, celery, asparagus
9. An omnivore is an animal that eats both plant and animal material.
10. Dangers include hunters, polluted water or food supplies, lack of food, and drained lakes and ponds.
11. Waterfowl (ducks and geese) might remain all winter. Some algae might continue to grow if enough light were available and temperatures did not drop too low.
12. Some die, some winter as eggs or immature stages that hibernate, and some hibernate as adults.
13. (a) Muskrats feed on underwater plants during winter.
   (b) When the first ice forms on the pond, the muskrat chews a hole through the ice and hauls vegetation up onto the surface. These plants freeze and become covered with snow, forming a well-insulated "push-up" or domed feeding station. The opening to the pond (called a plunge-hole) is kept ice-free by the muskrat as it hauls food up into its igloo-like kitchen.

Autumn – Activities

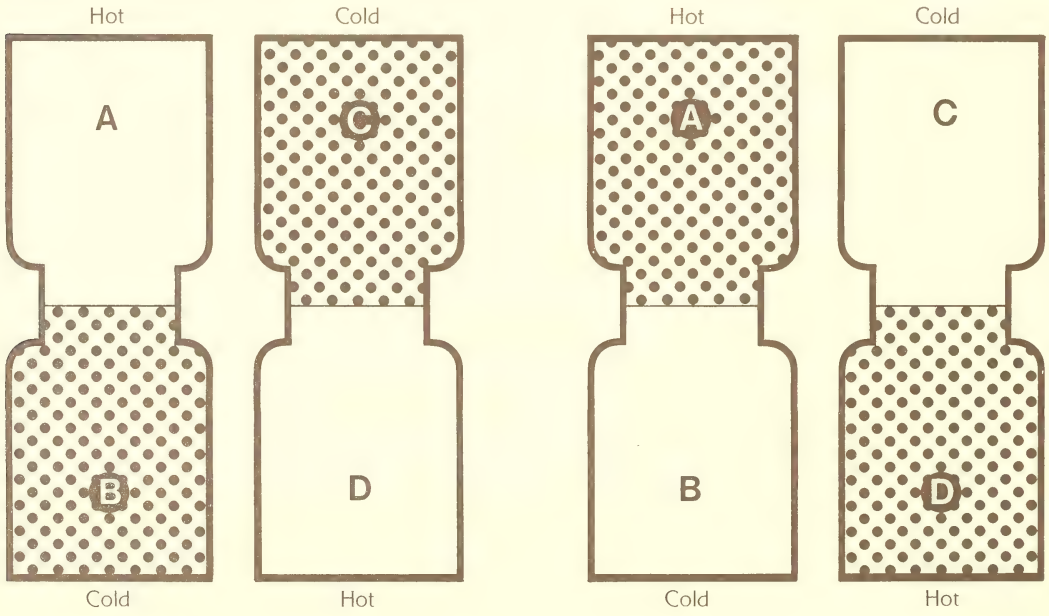
1. Fall overturn is a result of the convection currents set up in the pond. You can demonstrate this to your students by doing the following experiment, in which temperature differences cause currents in the water.

   Fill a large beaker two-thirds full of water.
   Set the beaker on a ring stand and allow several minutes for the water currents to stop.
   Gently add several drops of food colouring to the surface, being careful to disturb the water as little as possible.
   Apply heat from a Bunsen burner to one corner of the beaker.
   Observe the movement of the dye.

   (a) What causes the water to move up and down?
   (b) How is this experiment similar to fall overturn?
   (c) How is this experiment different from fall overturn?
   (d) Does overturn occur in the pond in spring?
   (e) Are the currents as strong in spring as in the fall? Explain.
   (f) Is overturn stronger in shallow, eutrophic lakes or in deep lakes? Explain.

   You may want students to record water temperatures at different levels before, during and after the currents are set up.

2. Students can also study convection currents by doing the following experiment on their own. Accidents may happen with the water, so you may want to do this in a sink, a pan, or outside where spills can be easily wiped up.



Each student (or group of students) will need 4 glass jars. The jars must have smooth lips, with no cracks or chips. The mouths of the jars must be exactly the same size so they will fit together. Each group will also need 2 squares of waterproof cardboard (e.g. a waxed milk carton) cut a bit larger than the mouth of the jar.

Fill two of the jars to the brim with very hot tap water (A & D.)
Fill the other two jars to the brim with ice water (B & C.)
Add several drops of blue food coloring to B and C (the cold water.)
Mix the coloring into the water.
Place one piece of cardboard over A (hot.) Try to avoid trapping any air bubbles in the water.
Turn the jar upside down and place it over B (cold.)
Gently remove the cardboard, ensuring that the mouths of the two jars are lined up so that no water leaks out.

Describe what happens to the colored water.
Place C (cold) over D (hot.)
Describe what happens to the colored water.
Repeat the experiment, this time using clear ice water and adding red food coloring to the hot water.
Describe what happens to the food coloring in each set of jars.

3. Plants usually store food in the form of starch. You can use iodine to test for starch. (Amber-colored iodine turns blue-black in the presence of starch.) This test should be applied to some plants from the area to be studied.

   (a) Add a few drops of iodine to a freshly cut potato slice. What happens? What does this indicate?
   (b) Not all plants store food in roots or underground stems.
   Discover where a corn plant stores its food. Try the iodine test on a kernel of corn. Soak a kernel in water to soften the seed coat, cut the seed open, and apply the iodine.

4. House flies, like most pond animals, are cold-blooded. The following experiment will illustrate the effect of temperature on house flies. (Any active, cold-blooded animal will do, including ants, crickets or fruit flies.) Catch the insects, or obtain them from the Science Resource Centre, or raise flies from maggots bought at a bait store. (A similar experiment in Program 5, **Winter,** is designed to simulate the effect of winter on cold-blooded animals.)

   Use two jars, with lids. Add small holes for air to circulate.
   Put two or three house flies in each jar.
   Place one jar in a sunny window or under a lamp.
   Place one jar in a bed of crushed ice (or in the fridge for an hour.)
   Observe the effect the different temperatures have on the flies.

   (a) Which flies show the least amount of activity?
   (b) What do you predict would happen if the jar at room temperature were placed in the fridge or on the crushed ice?
   (c) What do you predict would happen if the chilled jar were to be placed in the sun?
   (d) Do you think plants are also affected by temperature? Explain your answer.

   A similar experiment using aquatic invertebrates could also be tried. Collect some pond animals (mosquito larvae or the larvae of other active animals.) Place some of them in pond water at room temperature. Place several others in very cold pond water. (Keep some pond water overnight in the fridge or put a couple of ice cubes in the water to cool it.) Have the students observe the two containers of water side by side.

5. Set up three sprouting trays, with about 5 centimetres of soil in each. Plant about 10 seeds in each tray. (Radish seeds and mung beans sprout quickly.)
   Place one tray in a sunny window, one in a dark cupboard. Leave the third tray in the room, but not in direct sunlight. This will be the control tray. Check each tray every day and water as needed.
   Observe the plants over a period of a month.

   (a) Do these plants need light to sprout?
   (b) What color are the leaves of the plants kept in the sun?
   (c) What is this coloring called?
   (d) What is happening to the leaves?
   (e) What color are the leaves of the plants kept in the dark?

(f) Will these plants survive if they are kept in the dark? Explain your answer.
(g) Predict what will happen if these trays exchange places.
(h) Place the dark tray in the sunlight and the sunny tray in the dark. Do any changes occur?

6. As the amount of oxygen in pond water decreases, the amount of carbon dioxide increases. Animals (including people) breathe in oxygen and breathe out carbon dioxide. The oxygen-carbon dioxide cycle in the pond can be illustrated by the following experiment using bromthymol blue (BTB.) BTB is blue in the presence of a base and turns yellow in the presence of an acid (as when carbon dioxide is bubbled through it producing carbonic acid.)

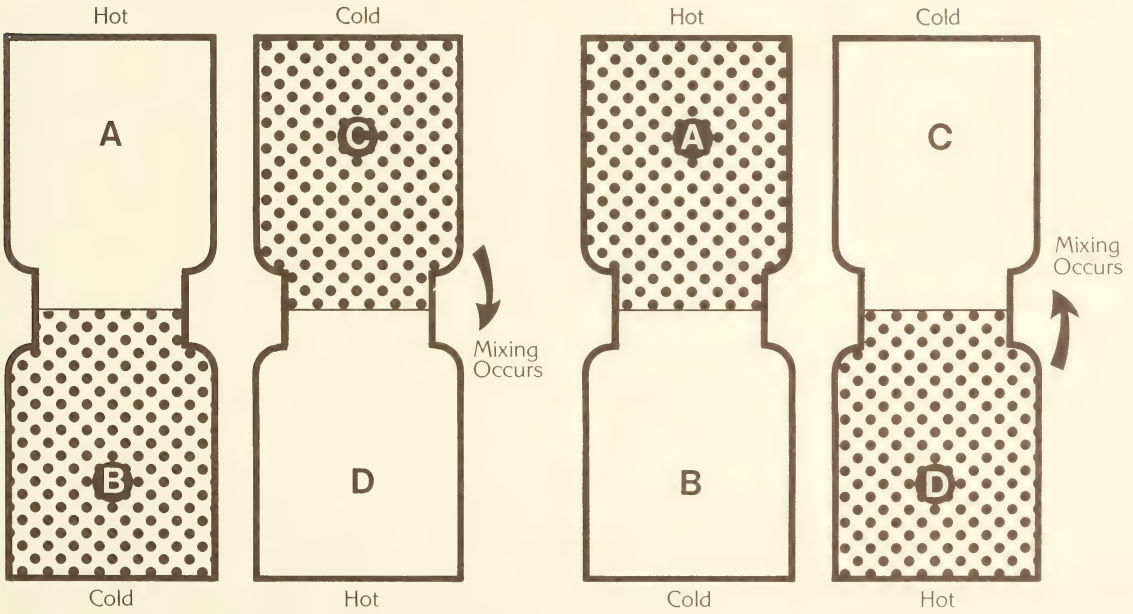
Fill two test tubes or plastic pill bottles with BTB.
Leave one container of BTB as a control.
Using a straw, blow bubbles into the second container of BTB until a color change occurs.
Place a fresh piece of pond weed or an aquarium plant in the yellow BTB. Fill the container to the top with additional yellow BTB, then put a stopper or a cap on it. Avoid trapping any air bubbles in the container. Place this container in sunlight or under a lamp.

(a) What color was the BTB before you began the experiment?
(b) What color was the BTB after you blew into it?
(c) What happened to the color of the BTB after the plant had been in it for an hour or so?
(d) What gas do green plants produce when light is present?
(e) What gas do people breathe out?
(f) What do you predict would happen if you placed a green plant in the yellow BTB and then put the container in the dark?
(g) Many of the green pond plants die in autumn or slow their growth as they prepare for winter. What will happen to the amount of oxygen in the pond once winter comes? What will happen to the amount of carbon dioxide in the pond water?

Autumn
Answers To Activities

1. (a) Warm water rises, cool water sinks. The rising and sinking forms currents.
   (b) Water currents form causing mixing of all the layers.
   (c) In fall, currents form because heat is being lost from the surface. Here, in this experiment, heat is being applied to the bottom, rather than being lost from the top.
   (d) Yes.
   (e) Spring overturn is probably not as strong since the surface is being warmed by the sun, and warm water tends to stay near the surface. However, during spring, strong winds churn the surface and also cause mixing of the layers.
   (f) Overturn is stronger in deeper lakes, where there are greater differences in temperature between the top and bottom of the lake.

2. In experiments where the hot water is on the top and the cold water is on the bottom, there will be little mixing of colors, since warm water tends to stay on top.
   When the cold water is on top and the warm water is on the bottom, there will be a definite mixing of colors as the cold water sinks, pushing the warmer water to the surface.



3. It turns blue-black, indicating that starch is present.

4. (a) The ones in the cold show the least activity. Their body functions slow down as the temperature drops. until a point is reached where all activity stops.
   (b) The air temperature would drop, and the flies would become less active.
   (c) As the air in the jar became warmer, the flies would also warm up and become more active.
   (d) Individual student answers.

5. (a) No. (The plants in the cupboard may appear to be growing faster than the ones in the light. In fact, they are actually searching out light and will become weak and spindly, similar to sprouts on potatoes kept in the dark.)
   (b) Green
   (c) Chlorophyll
   (d) Food is being made.
   (e) Pale yellow
   (f) No, because no food is being made.
   (g) The green leaves will gradually lose their color while the pale yellow leaves will turn green.
   (h) Answers based on student observations. (This exchange of trays must be done before the plants in the dark die as a result of no food.)

6. (a) Blue
   (b) Yellow
   (c) It turned blue again.
   (d) Oxygen
   (e) Carbon dioxide
   (f) The BTB would stay yellow because the plant would be unable to produce oxygen.
   (g) The amount of oxygen will decrease; the amount of carbon dioxide will increase.

Autumn – Glossary

annual
diving beetle
dormant
energy
fall overturn
hibernate
inactive
insulate
spore
staging area
warm-blooded

Winter – Questions

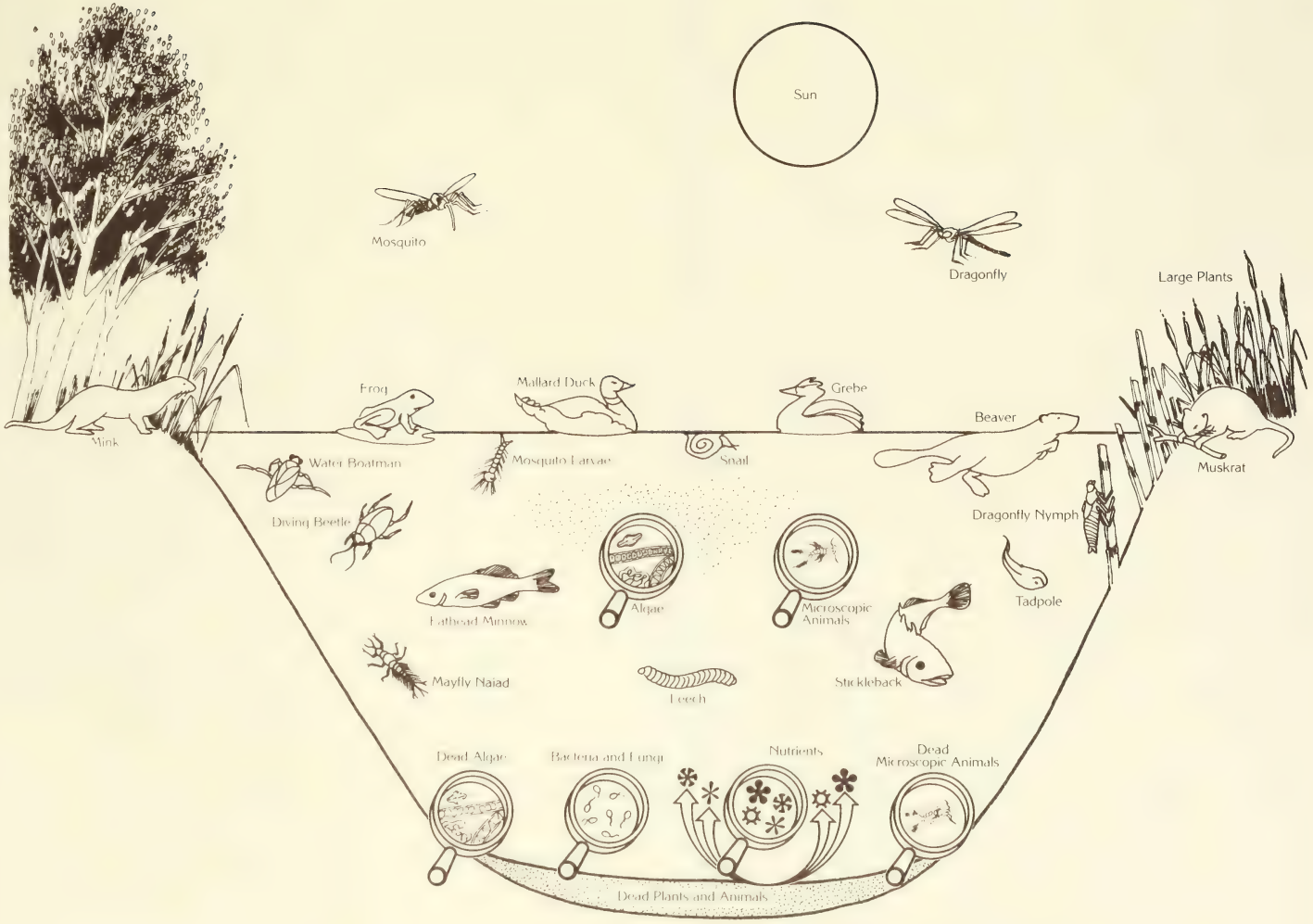
Winter – Activities

PROGRAM 5

Winter – Questions

1. How does the layer of ice and snow over the pond affect the temperature of the water below? How does it affect the amount of light in the pond?
2. Explain the difference between annual plants and perennial plants.
3. What happens to the plants and animals that die in the pond?
4. Why are decomposers important?
5. What are nutrients?
6. What is winter-kill?
7. (a) Why are rainbow trout no longer found in Astotin Lake?
   (b) Why are fathead minnows and sticklebacks able to survive winter in the pond?
8. What do we mean when we say an animal is cold-blooded? Give two examples of cold-blooded pond animals.
9. Here is an example of a summer food web for a pond. Change this drawing to a winter setting by doing the following:
   (a) Draw a layer of ice and snow over the pond.
   (b) Put an "X" through those organisms that die as winter approaches.
   (c) Put an "S" through those organisms that slow down their activities during the winter.
   (d) Put an "A" over those organisms that remain active all winter, without much change in their behavior.
   (e) Put an "H" over those organisms that hibernate or become inactive during the winter.
   (f) Put an "M" over those organisms that migrate before winter comes.
10. Occasionally, winter lasts longer than usual. What happens to a beaver family whose food supply is used up before the ice and snow disappear?

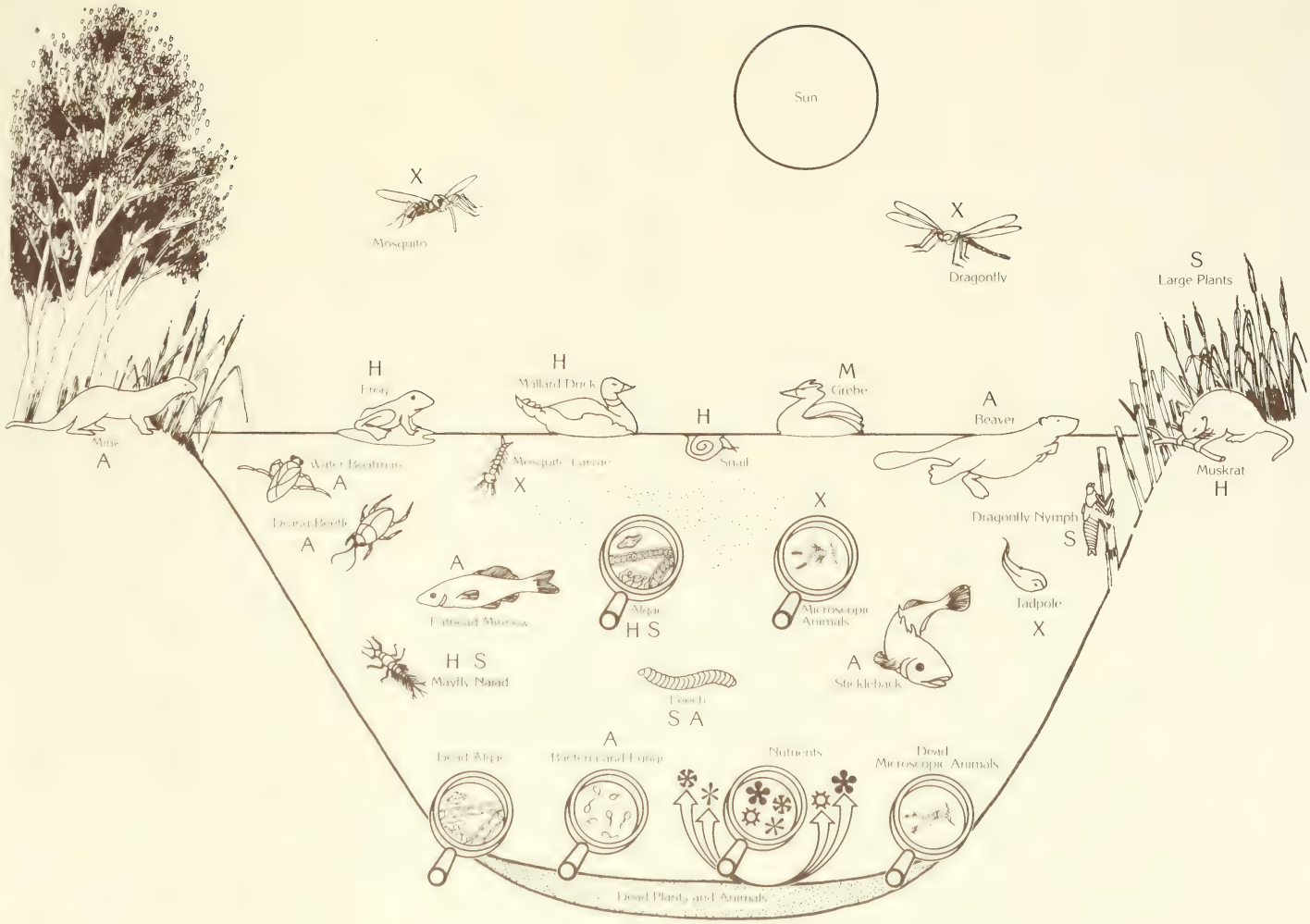
A Pond Ecosystem



Winter
Answers To Questions

1. The layer often keeps the water below warmer than the air above. It prevents the water from freezing all the way to the bottom.
   Layers of ice and snow block out almost all light, making the pond dark.
2. Annual plants live for only one year or one season. Perennials live more than one year.
3. They rot, decay, decompose, or break down.
4. They break down the bodies of dead plants and animals, and release nutrients back into the water. This allows new growth to occur.
5. Nutrients are special substances needed by plants and animals for proper growth.
6. Winter-kill is the death of pond animals during winter as a result of lack of oxygen.
7. (a) They died as a result of winter-kill.
   (b) Besides being smaller than the trout, these fish require less oxygen than trout of similar size.
8. A cold-blooded animal is one whose body temperature is the same as the temperature of its surroundings. Examples include all fish, amphibians, reptiles, and invertebrates.
9. Answers based on diagram
10. The beaver would be forced to come above the ice and search for food around the pond. They are awkward on land and easily killed by predators. Also, if the ice were very thick, they might be unable to chew a hole through it and get up onto the land.

A Pond Ecosystem



Winter – Activities

1. Cold-blooded animals are unable to control their own body temperatures. The temperature of their surroundings plays an important role in their lives.
The following experiment is designed to simulate the effect of winter temperatures on cold-blooded animals. (A similar experiment in Program 4, **Autumn,** illustrates the effect of hot and cold temperatures on cold-blooded animals.) Any active, cold-blooded animal will do, including house flies, ants, crickets or fruit flies. (Catch them outside or obtain them from a Science Resource Centre. Flies can also be raised from maggots obtained from a bait store.)

   Each student (or group of students) will need two glass jars, each with a lid. The lid should have air holes. A piece of stocking stretched over the jar mouth and held in place with an elastic band can also be used.
Put a couple of twigs in each jar for the flies to crawl on.
Put 4 to 6 flies in each jar.
Leave one jar at room temperature. (Avoid direct light or heat.)
Observe the activity in both jars for several minutes.
Place the second jar in a bed of crushed ice. (The ice should come half to two-thirds of the way up the side of the jar.)
As soon as the jar is placed in the ice, begin timing. Record observations every 5 minutes. Note the type and amount of activity.
After about 20 minutes, place the jar in the fridge.
After 24 hours, remove the jar from the fridge. Record observations every 5 minutes as the jar and its contents warm up to room temperature.
   (a) Name a cold-blooded pond animal that survives the winter by hibernating or becoming dormant (inactive.)
   (b) In what other ways do cold-blooded animals deal with cold weather?

2. Decomposition is an important activity in the pond during winter. The decomposers use up much of the oxygen in the pond water as they break down the remains of dead plants and animals. Although decomposers are usually too small to see without a microscope, we can observe the results of their activity.

   Pond Water Decomposition
Pour several centimetres of water from a pond or an aquarium into a beaker or a glass jar. Add an equal amount of tap water to a second beaker. Drop about ten seeds (radish, grain, pea seeds, or seeds from plants in the area to be studied) into each beaker.
Place the beakers in a warm spot in the room, but not near a direct source of heat or light.
Observe the beaker for 5 to 7 days.
Record any changes that you see in the water or the seeds.
   (a) Do you notice any difference in smell between the two beakers? Which beaker has the worst smell?
   (b) What process is occurring?
   (c) In which beaker is the process occurring faster? Can you explain why?
   (d) Predict what would happen if you left the experiment set up for several weeks.

   Mold Garden
If pond or aquarium water is not available, set up a mold garden.
Place a damp paper towel in a glass jar.
Expose a piece of bread to the air, or wipe it over a counter surface.
Put the bread in the jar on top of the paper towel.
Set up a second jar in exactly the same way, but use a dry paper towel instead of a damp one.
Cover both jars with a loose fitting lid.
Place both jars in a cupboard.
Observe the two jars over a period of several days.
Describe any changes that you see.
   (a) What happens to the bread in the damp jar?
   (b) What happens to the bread in the dry jar?
   (c) Examine some of the mold under a microscope or with a hand lense. What do you see?
   (d) Is mold a producer, a consumer, or a decomposer? Explain your answer.

TIME (in minutes)	DESCRIBE THE TYPE AND AMOUNT OF ACTIVITY SHOWN BY THE FLIES
0	
5	
10	
15	
20	
25	

Winter
Answers To Activities

1. (a) Frogs.
   (b) They become less active (insects and other invertebrates) or they die, leaving eggs behind to hatch out in spring (daphnia.)

2. **Pond Water Decomposition**
   (a) After several days, bubbles of gas appear on the water surface of the pond water and a strong odor is present. Tiny white filaments may be visible on the seeds, indicating the presence of decomposers.
   (b) Decomposition, decay, or breakdown
   (c) In the pond water beaker. Tap water is treated with chemicals such as chlorine, which slow down the process (in addition to killing other organisms in the water.) Microscopic decomposers (in this case, probably a type of water mold) are always present in the pond water.
   (d) The seeds would gradually break down completely, with an accompanying smell (by-product.)

   Mold Garden
   (a) Mold appears on the surface, and spreads over and through the bread.
   (b) Some mold may appear on this bread, but not to the extent of the damp slice.
   (c) If tiny, black dots appear on the bread, examine them under the microscope. These are spore cases, thin-walled structures containing thousands of spores.
   (d) A decomposer. (Mold is a type of fungus. Fungi do not contain chlorophyll and therefore are unable to make their own food.)
   It obtains the nutrients it needs by breaking down or decomposing material.

Winter – Glossary

Astotin Lake
diving beetle
fathead minnow
rainbow trout
stickleback
winter-kill

Elk Island National Park – Questions

Elk Island National Park – Activities

PROGRAM 6

Elk Island National Park Questions

1. What is a national park?
2. What three types of environments would you find in a western plains landscape?
3. Briefly describe how each of the following groups of people used the area in and around Elk Island:
   (a) native people (Sarcee and Cree)
   (b) trappers
   (c) early settlers
   (d) people today
4. What are insecticides?
   Can they cause problems for wetlands? How?
5. What types of activities can be enjoyed in Elk Island without harming the living waters?
6. Powerboats are not allowed on any of the lakes in the Park. Why?
7. Mosquitoes are a nuisance for visitors to Elk Island during the warm months of the year. What would you do about this problem, if anything? Read the next two paragraphs before making your decision.
   (a) Mosquitoes can be controlled by spreading a thin layer of oil over the surface of the water. This prevents the young (larvae and pupae) from breathing air, which they need to survive.
   Would this layer of oil affect any other organisms in the pond?
   Would you recommend this method? Why?
   (b) Imagine that a chemical were available that would kill the mosquitoes in the pond water. Would you use this chemical?
   Study the diagram of the pond ecosystem in Program 3 **(Summer.)**
   Is it possible to affect just one part of a food web without harming the rest of the web? What might happen in the pond if you used this chemical?
8. Suppose that oil were discovered in Elk Island National Park. Do you think that oil companies should be allowed to go into the Park and remove the oil? Give reasons for your decision.
9. Elk Island National Park is surrounded by fence to keep the bison from wandering away. Do you think the fences should be removed?
   What might happen if the fences were taken down?
10. Suppose that some farmers in the area around Elk Island wanted more farmland and suggested that the size of the Park be reduced. Would you recommend giving the farmers land from the Park? Explain the reasons for your decision.
11. Are there ponds or wetlands near where you live? What are these areas being used for?

Elk Island National Park Answers To Questions

1. A national park is an area set aside to protect and preserve a certain type of environment.
2. Grassland, forest and wetlands
3. (a) The native people may have used the area as a wintering ground, and as a source of furs and food such as berries.
   (b) Trappers came in search of fur-bearing animals.
   (c) Settlers used fire to clear the land of trees. They then planted crops.
   (d) People today use the area around the Park for farmland. The Park itself provides a source of recreation.
4. Insecticides are poisons used to kill insects.
   Yes, by killing off many of the insects in the pond that are needed as food by birds and fish.
5. Recreation includes swimming, canoeing, hiking, bird watching, cross-country skiing, snowshoeing and photography.
6. The lakes and ponds are shallow. Even Astotin Lake, the largest in the park, averages only 4 metres in depth. The noise and speed of the boats also presents a problem for nesting birds.
7. (a) All organisms that come to the surface to breathe would be affected, including water boatmen and diving beetles. Any animals, like dragonflies, that crawled out of the water to turn into adults would be covered with a film of oil that might coat the newly-formed wings. Waterfowl would get oil on their feathers, which they might swallow during preening. Ducklings with oil on their feathers might lose the insulating qualities of their down.
   (b) Any organisms that the mosquitoes fed on or were eaten by would be affected by the disappearance of the mosquitoes. Removing all the mosquitoes might mean the disappearance of other organisms in the pond, which in turn could lead to further upsets.
8. Individual student answers
9. Individual student answers
10. Individual student answers
11. Individual student answers

Elk Island National Park Activities

1. Instructions to teachers:
Amiskwi Lake, mentioned in this activity, is patterned after Astotin Lake in Elk Island National Park. After students have drawn up their plans for Amiskwi Lake, refer them to the brochure maps of Astotin Lake and compare the different sets of plans. Discuss reasons why certain activities are allowed while others are not. Discuss the advantages/disadvantages of activities or facilities in certain areas as opposed to other areas. (Some students may wish to make models of their development plans.)

Instructions to students:
Your group has been asked to develop a plan for Amiskwi Lake, a eutrophic lake in a knob-and-kettle landscape. The lake is in a National Park. A map of the lake and the surrounding area has been provided, along with some information regarding the plants and animals in the area. Your task, as a park planner, is to decide:

(a) what activities will be allowed in the area
(b) where these activities (and any buildings or structures) will be located.

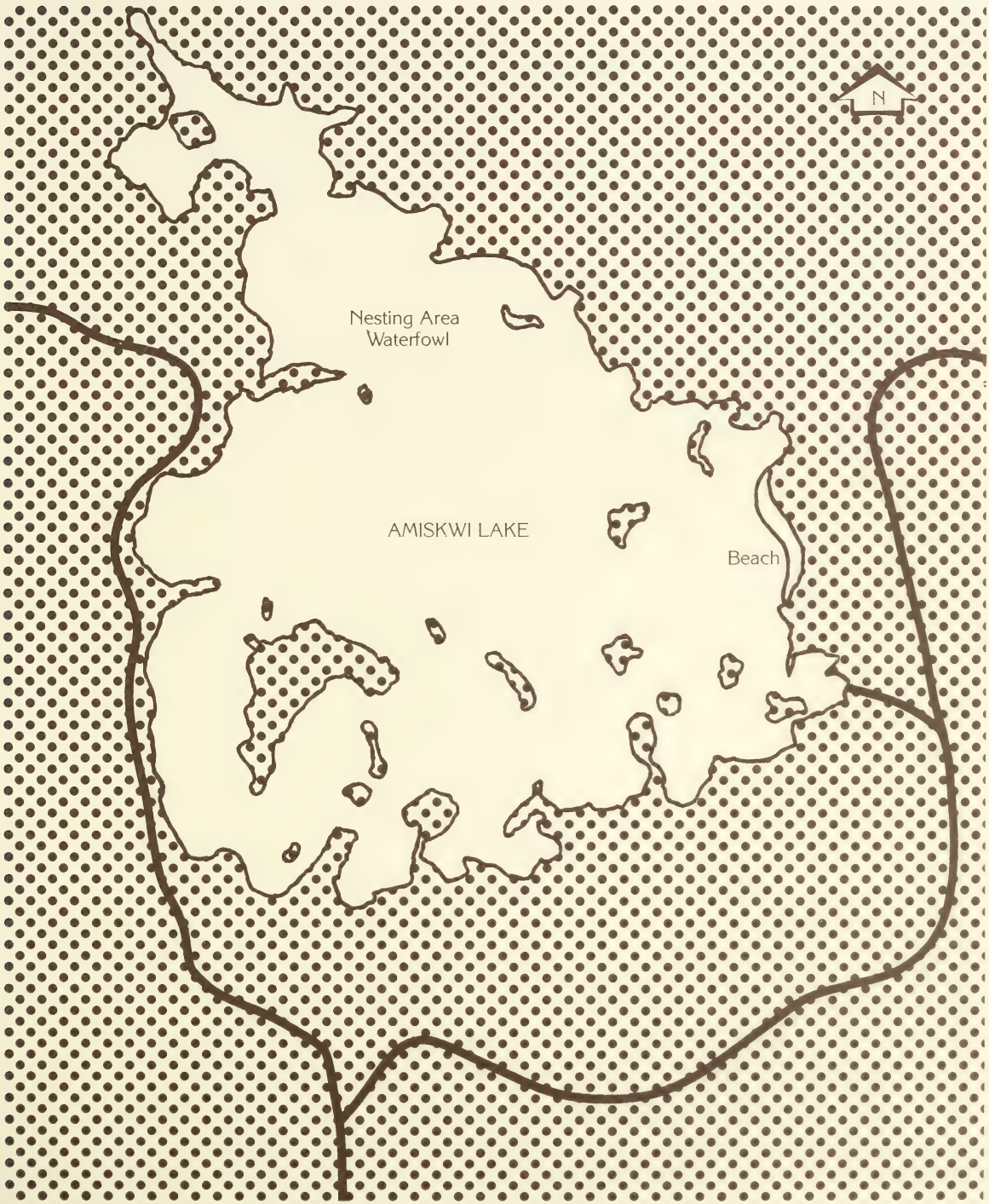
Be prepared to explain why you made your decisions.

Amiskwi Lake has no development at this time, but a number of people are pressuring the Park staff to develop the area. Here is a checklist of possible uses. The list was put together based on what visitors and business people wanted to see in the Park. What will **you** allow?

- ☐ Day use only, no overnight stays
- ☐ Primitive camping, tents only
- ☐ Campers and vans
- ☐ Motor homes
- ☐ Trailers
- ☐ Pit toilets
- ☐ Flush toilets
- ☐ Water pump
- ☐ Hot and cold running water
- ☐ Showers
- ☐ Washers and dryers
- ☐ Electrical hook-ups for campers, trailers, and motor homes
- ☐ Sewage dump station for trailers, motor homes
- ☐ Restaurant
- ☐ Souvenir store
- ☐ Gas station
- ☐ Small grocery store
- ☐ Dogs/cats permitted
- ☐ Picnic sites
- ☐ Motel
- ☐ Golf course
- ☐ Parking
- ☐ Boat launch
- ☐ Canoes
- ☐ Power boats
- ☐ Windsurfing
- ☐ Information booth
- ☐ Swimming
- ☐ Fishing
- ☐ Nature trails
- ☐ Programs about the plants and animals
- ☐ Snowshoeing
- ☐ Cross-country skiing
- ☐ Skidooing
- ☐ Skating

OTHER USES suggested by you and your staff

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____


N
Nesting Area
Waterfowl
AMISKWI LAKE
Beach

2. Surveys are designed to gain information. Have your students put together an "opinionaire" on Elk Island National Park. Then have them survey parents and relatives, teachers and other students. The following are some questions students might consider when designing their opinionaire.

   (a) What do you want to find out? (This will determine the types and number of questions asked.) Perhaps you want to find out if people know about Elk Island, where it is, what facilities are available, and so on. You might want to conduct a survey to find out how often people visit your park, what activities they take part in and what time of the year they visit.
   (b) How many people should be surveyed?
   (c) Who will be surveyed?
   (d) How will the survey be done? (For example, will it be a sheet to be filled in and returned, or, will each student do an on-the-spot survey?)
   (e) How will the results be tabulated? (Will it be in the form of graphs or data tables, anecdotal reports, or some other form?)
   (f) What will be done with the results? (Will they be part of a report on the Park? Will the class forward their results to Park staff for comments?)

3. Using the information contained on Poster #1: History of Elk Island National Park, draw a timeline for the park. Indicate important dates and what occurred in or around the Park.

Elk Island National Park Glossary

game preserve
insecticide
marten
western plains
wetlands

And At The Back. . .

. . . a review test covering all six programs in the series

1. The lakes and ponds of Elk Island are (older/or/younger) than the Rocky Mountains.
2. A glacier is
   (a) snow
   (b) ice
   (c) moving ice.
3. Glacial till is a collection of
   (a) large rocks
   (b) small rocks
   (c) large and small rock mixed together.
4. The low rounded hills of Elk Island are called (kettles/or/knobs.)
5. Why is spring runoff so important in Elk Island?
6. The ponds and lakes of Elk Island are said to be eutrophic. What does this mean?
7. Circle each feature that applies to the waters of Elk Island:
   (a) deep
   (b) shallow
   (c) heat up quickly
   (d) heat up slowly
   (e) have a lot of nutrients
   (f) have few nutrients.
8. The series of changes from pond to marsh to meadow to forest is called:
   (a) creation
   (b) glaciation
   (c) succession.
9. An ecosystem is made up of two main parts, the living and non-living.
   Give two examples of the living part of an ecosystem.
   (a)
   (b)

   Give two examples of the non-living part.
   (c)
   (d)
10. Organisms that make their own food are called
    (a) consumers
    (b) decomposers
    (c) producers.
11. Organisms that break down the remains of dead plants and animals are called
    (a) consumers
    (b) decomposers
    (c) producers.

12. (a) Fill in the blanks using these words: cattails, muskrat, coyote.
(Some words may be used more than once. Some blanks may have more than one answer.)

(i) carnivore _____
(ii) consumer _____
(iii) decomposer _____
(iv) herbivore _____
(v) producer _____

(b) What is missing from the first box?

(c) The diagram is an example of a _____.

13. Place a check mark (✓) beside those things that green plants need to produce food:

(a) air
(b) chlorophyll
(c) sunlight
(d) water.

14. The waters of Elk Island often look like pea soup in summer. What causes this?

15. Algae and duckweed are annuals. Cattails are perennials. What do these words mean?

16. What do we mean when we say that an animal is cold-blooded?

17. Cold-blooded pond animals prepare for winter in several ways. List three of these ways.

18. How does fall overturn affect

(a) the temperature of the water?
(b) the amount of oxygen in the pond or lake?

19. Explain what winter-kill is.

20. Give two reasons why there is a shortage of oxygen in the pond during winter.

21. Why is the water in a pond in winter warmer than the air above the pond?

22. List two uses of wetlands that are harmful to pond life.

23. List two types of recreation that probably do not harm the living waters of Elk Island.

24. What is a national park?

25. If you could be any animal in the pond, what one would you choose to be? Why?

Review Test – Answers

1. younger
2. (c) moving ice
3. (c) large and small rocks mixed together
4. knobs
5. There are no permanent rivers or streams to fill up the lakes and ponds.
6. They are rich in nutrients.
7. (b) shallow, (c) heat up quickly, (e) have a lot of nutrients.
8. (c) succession
9. (a), (b) – any plant or animal
   (c), (d) – temperature, air, water, light, soil.
10. (c) producers
11. (b) decomposers
12. (a), (i) coyote
    (ii) coyote, muskrat
    (iii) no answer, leave blank
    (iv) muskrat
    (v) cattails
    (b) sun
    (c) food chain.
13. All four are needed.
14. population explosion of algae; algal bloom.
15. Annuals live only one season or one year; perennials live more than one year.
16. Its body temperature changes as the temperature of its surroundings changes.
17. (a) die (and leave eggs) – daphnia
    (b) hibernate, become dormant or inactive – frog
    (c) slow down but remain active – insect larvae, adult water beetles.
18. (a) It makes the water of the lake all the same temperature.
    (b) It increases the amount of oxygen and spreads it throughout the pond.
19. It is the death of large numbers of pond animals as a result of a lack of oxygen.
20. There are no green plants to produce oxygen and organisms in the pond use up what oxygen is available.
21. The snow and ice insulate the water from the cold air.
22. The use of it as a garbage dump, or for housing, or draining land for cropland.
23. swimming, nature studies, photography, canoeing, hiking, cross-country skiing
24. It is a special area set aside to protect and preserve a certain environment.
25. Individual student answers.

Glossary

advance	the forward movement of a glacier, when the accumulation of ice is greater than the amount that is melting
algae	plants, sometimes microscopic in size, that contain chlorophyll; common in pond water
algal bloom	a sudden rapid growth of algae that often produces a "pea-soup" effect in the water
amoeba	a single-celled, microscopic organism common in pond water
annual	a plant that lasts only one year or one season
aquatic life	organisms living in or near water
Astotin Lake	the largest lake in Elk Island National Park
backswimmer	a small aquatic pond bug that swims on its back
bacteria	microscopic organisms that play an important role in decomposition
bladderwort	a carnivorous pond plant
bufflehead	a small diving duck that often nests in woodpecker holes in trees
caddis fly	a moth-like insect whose larval stage is passed underwater, when it is often enclosed by tiny grains of sand or bits of plants
carbon dioxide	a gas in the atmosphere used by green plants during food-making; it is also a waste product of most animals
carnivore	an animal that eats other animals
chlorophyll	a green chemical found in most plants, produced only in the presence of sunlight, which converts carbon dioxide and water into carbohydrates
cold-blooded	an animal whose body temperature is affected by the temperature of its surroundings
consumer	an organism (either animal or plant) that is unable to produce its own food
continental ice sheet	a huge, continuous sheet of ice that, in the case of North America, once covered much of the continent except the highest mountain peaks
coot	a duck-like bird common on ponds and in marshy areas
crane fly	large, mosquito-like insect whose larva lives in shallow water or moist soil
daphnia	tiny, active aquatic organism; also called a water flea
decay	to rot or break down
decomposer	an organism, such as a bacterium, that breaks down a dead plant or animal
decomposition	the breakdown or decay of dead organisms
diving beetle	a carnivorous, air-breathing beetle common in pond water
dormant	inactive; asleep

duck factory	an expression applied to Elk Island and the surrounding area because of the tremendous number of ducks born there each year
ecosystem	a group of plants and animals living in a particular environment; it consists of living organisms and such non-living factors as light and temperature
Elk Island National Park	a natural area of about 195 square kilometres located east of Edmonton
environment	all the living and non-living things that surround an organism and affect its life
eutrophic	rich in dissolved nutrients
fairy shrimp	a small pond organism (crustacean) that swims about on its back
fall overturn	the mixing of lake and pond water in the fall as the result of wind action and temperature differences in the water, which set up convection currents; it stops when the water temperature is the same throughout
fathead minnow	one of two species of small fish found in Elk Island; able to survive on very small amounts of oxygen
filament	a single thread
first-order consumer	an animal that eats plants; a herbivore
food chain	the sun, a producer, and one or more consumers joined together
food web	a series of food chains joined together or interrelated
fourth-order consumer	an animal that eats a third-order consumer; a carnivore
game preserve	an area where game animals, such as elk and moose, are protected
glacial till	a mixture of gravel, rocks, sand and, finely powdered material deposited by a glacier
glacier	a large mass of slow-moving ice; an extension of an ice field or an ice sheet
habitat	the place where a plant or animal normally lives and grows
herbivore	an animal that eats plants; a first-order consumer
hibernate	to become inactive or dormant
hydra	tiny, soft-bodied pond organism that captures prey by using special structures on its tentacles
ice age	a time when ice sheets and glaciers were widespread and covered much of the earth
inactive	not active; sluggish
insecticide	a chemical that kills insects
insulate	to prevent the transfer of heat
kettle	a hollow or depression formed by the melting of a large chunk of ice buried in glacial material
knob	a low, rounded hill made of material deposited by a glacier

mallard	a common, surface-feeding duck of ponds and lakes
marsh	an area of soft, wet land
marten	a member of the weasel family trapped for its fur
mayfly	an air-borne insect whose larva lives underwater
meadow	an area, usually flat and moist, containing mostly grass
migrate	to move from one place to another
mineral	a non-living substance utilized by organisms to aid growth
moult	to shed feathers
naiad	the immature aquatic stage of some insects, including dragonflies, damselflies, and mayflies
nitrogen	a chemical needed by all living things for growth and for the repair of tissues
nutrients	special food substances such as nitrogen and phosphorus needed by living organisms for proper growth
organism	any living thing, plant or animal
overturn	mixing of the layers of pond or lake water in spring and fall as a result of temperature differences and wind action
oxygen	an important gas, occurring in air and water and needed by almost all living things
paramecium	a microscopic, single-celled animal that feeds on bacteria, tiny algae, and other microscopic organisms
perennial	a plant that lives for several years
phosphorus	a nutrient needed by living organisms
population crash	a sudden, rapid decrease in numbers of a particular organism
population explosion	a sudden, rapid increase in numbers of a particular organism (see "algal bloom")
predator	an animal (carnivore) that kills another animal for food
producer	a plant that contains chlorophyll and is able to make its own food
push-up	a mound of frozen vegetation covering a hole in the ice that is made and used by a muskrat as a breathing hole and a feeding station; it is not used as a home
rainbow trout	a large fish of western North America that requires a high level of oxygen
red-necked grebe	a common bird of Elk Island well adapted for aquatic life
red-winged blackbird	a robin-sized bird that nests in reeds along a pond/lake edge
retreat	the shrinking or withdrawal of a glacier, when the amount of ice that accumulates is less than the amount that is melting
rotifer	a tiny microscopic animal found in pond water
runoff	rain and melting snow that runs off the land during certain times of the year

sandhill crane	a migratory bird that makes only a brief stop at Elk Island
second-order consumer	an animal that eats a first-order consumer; a carnivore
sideswimmer	a small, pond animal whose body is flattened sideways; also called a scud, it swims on its side
spore	a seed-like reproductive structure produced by algae, molds, and certain other plants
spring overturn	see "overturn"
staging area	an area where waterfowl gather before or during migration before commencing the next phase or stage
stickleback	one of two small species of fish at Elk Island; able to survive on very small amounts of oxygen
succession	the series of changes that occur in a community of plants and animals
summer-kill	the death of many pond animals caused by a shortage of oxygen in the water
third-order consumer	an animal that eats a second-order consumer, a carnivore
toe	the front or leading edge of a glacier
warm-blooded	an animal whose body temperature remains constant and does not vary with changes in its environment
water boatman	a slender, air-breathing bug that feeds on algae or decaying plant or animal material in the pond
water flea	see "daphnia"
waterfowl	birds, such as ducks and geese, that spend much of their time on or near water
water strider	a slender, long-legged carnivorous bug that skates or jumps on water surfaces; also called a pond skater
western plains	relatively flat areas in western Canada, covered with grasslands, forests and wetlands
wetlands	areas containing much moisture, such as a marsh or a knob-and-kettle landscape
whirligig beetle	a small pond beetle that skims over the surface or dives underwater in search of food
winter-kill	the death of many pond animals caused by a shortage or lack of oxygen in the water

Suggested Resources

A Crowded Wilderness (motion picture)
National Film Board of Canada, 1972. 9 min., sd., color.
Attempts by the National Parks to deal with increasing demands made on wilderness resources.

Beyond the Naked Eye (motion picture)
National Film Board of Canada, 1973. 18 min., sd., color.
A look at the universe contained in a single drop of water taken from an aquarium.

Dear Joe (motion picture)
National Film Board of Canada, 1973. 28 min., sd., color.
The selection, planning, development and maintenance of Canada's National Parks.

Freshwater World (motion picture)
National Film Board of Canada, 1974. 25 min., sd., color.
A look at the vulnerability of freshwater, the damage that has been done to it and how it can be restored and protected.

Frogs, Snakes and Turtles (motion picture)
C.B.C., 1976. 28 min., sd., color.
Available through the N.F.B.

The Great Blue Heron (motion picture)
National Film Board of Canada, 1979. 45 min., sd., color.
A year in the life of the heron tells us much about ecology and wildlife.

The Rocky Mountains (motion picture)
From **The Nature of Things**, 1976. 28 min., sd., color.
Demands for roads, towns and campsites, and recreation are destroying the natural environment.
Available through the N.F.B.

The Water's Edge: The Silent Explosion (motion picture)
C.B.C., 1976. 28 min., sd., color.
The frenzied activity of springtime in the pond and along its edge.
Available through the N.F.B.

The Water's Edge: The Unseen World (motion picture)
C.B.C., 1976. 28 min., sd., color.
Microscopic animals and their predators in a freshwater pond.

Water, water, everywhere . . . (motion picture)
National Film Board of Canada, 1971. 5 min., sd., color.
The underwater, close-up death of a trout in polluted water.

What is Life? (motion picture)
National Film Board of Canada, 1970. 9 min., sd., color.
Characteristics that distinguish the living from the non-living.

Books And Articles

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